Ambient Air Data Trends



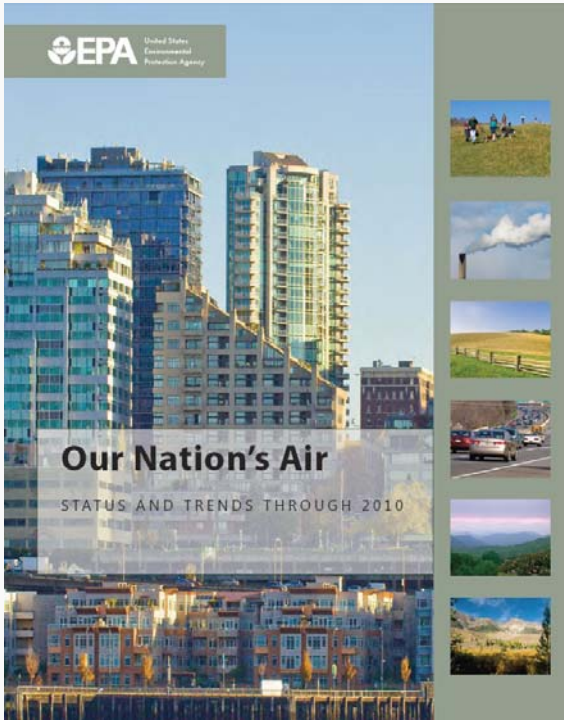
U.S. EPA, Office of Air Quality Planning and Standards

2012 National Air Quality Conference – 5/15/2012

for more information: dolwick.pat@epa.gov

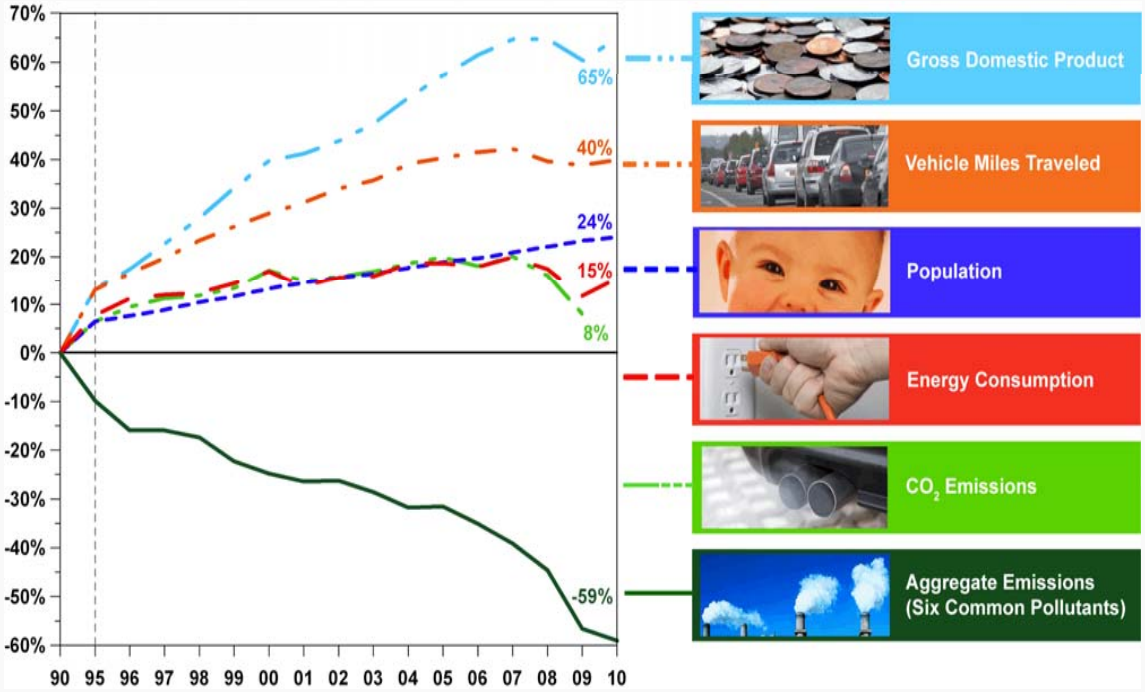
Introduction / Outline

- Entire ambient air trends message in just 5 slides!
- But wait … there's more … specific trend analysis nuggets:
  - Greatest AQ success story of the past decade?
  - Was the recent historically clean AQ simply a mirage?
  - What do we know about short-term SO_2 trends?
  - What can be said about air toxics trends?
- As a one-time special offer … closing thoughts



http://www.epa.gov/airtrends

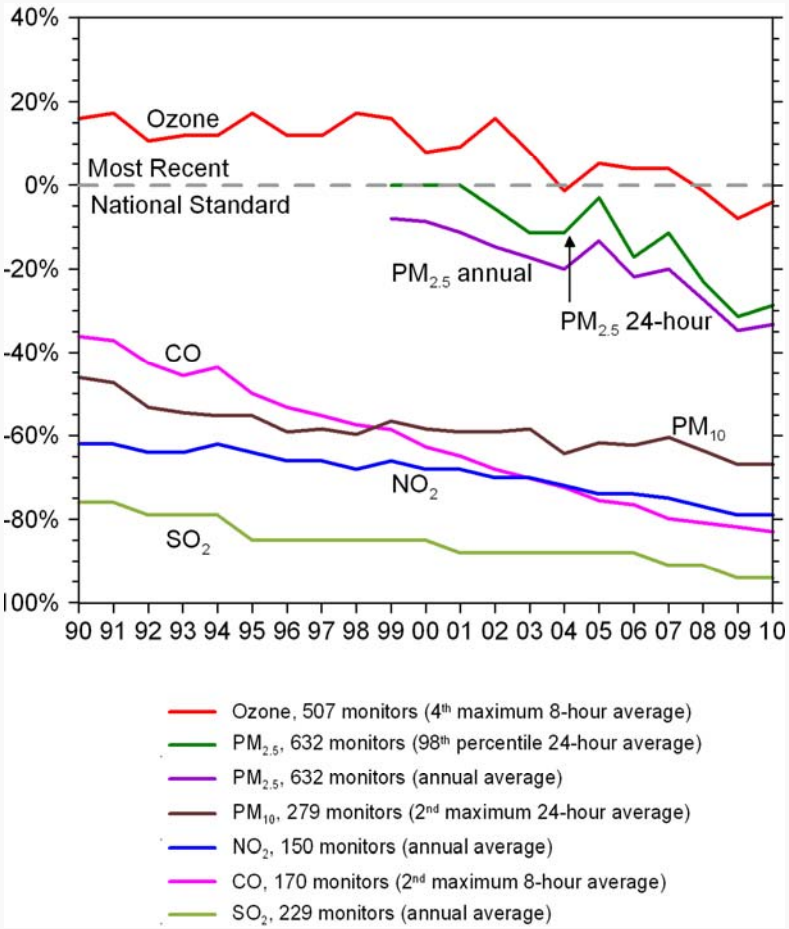
Significant reductions in criteria pollutant emissions have occurred over the past decades [1]



These emissions reductions have occurred concurrently with increasing economic activity, demonstrating that air pollution controls can co-exist with a healthy economy.

http://www.epa.gov/airtrends

These emissions reductions have translated to large improvements in air quality over the U.S. [2]



Trends in national AQ levels (1990-2010):

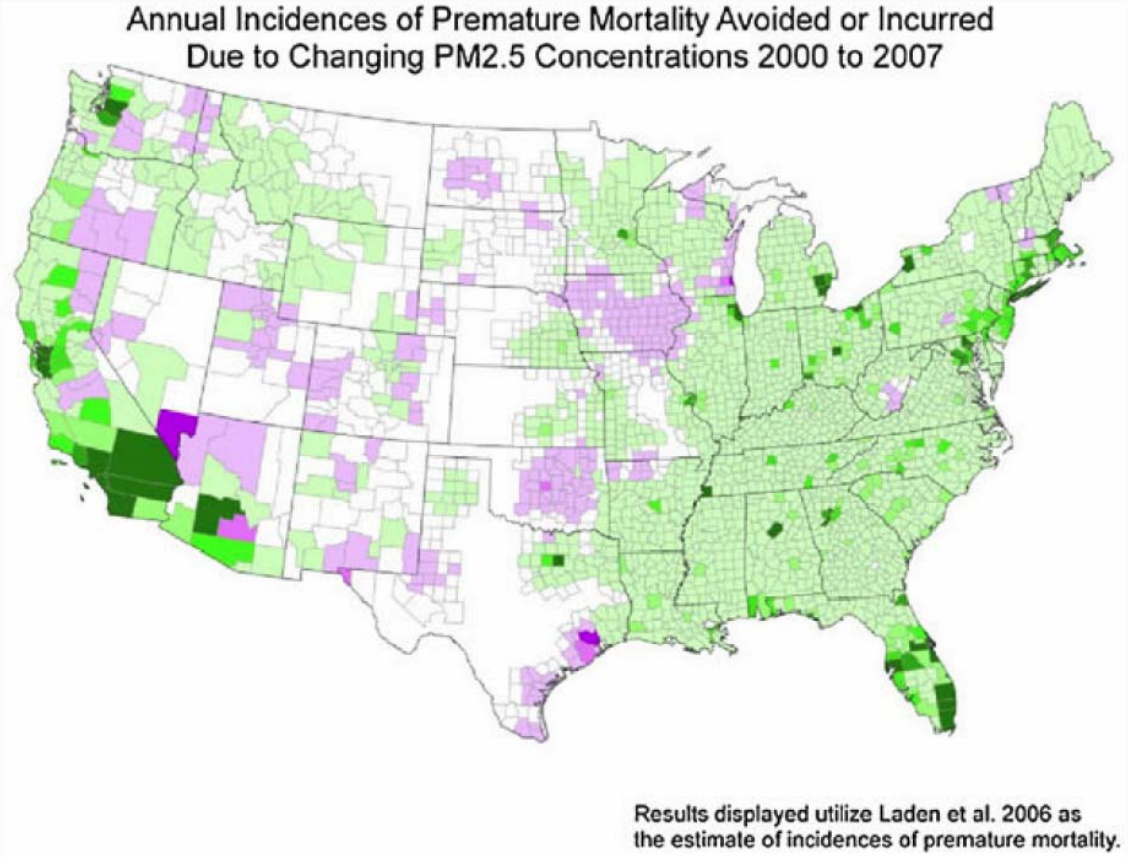
- Ozone (4th high): 17%
- PM_{10} (2nd high): 38%
- NO_2 (annual average): 45%
- CO (2nd max): 73%
- SO_2 (annual average): 75%
- Lead (max 3-month average): 83%

Trends in national AQ levels (2001-2010):

- PM2.5 (annual average): 24%
- PM2.5 (98th percentile): 28%

http://www.epa.gov/airtrends

These AQ improvements have led to large health benefits [3]



$PM_{2.5}$ and O_3 improvements between 2000 & 2007 have led to significant reductions in premature mortality:

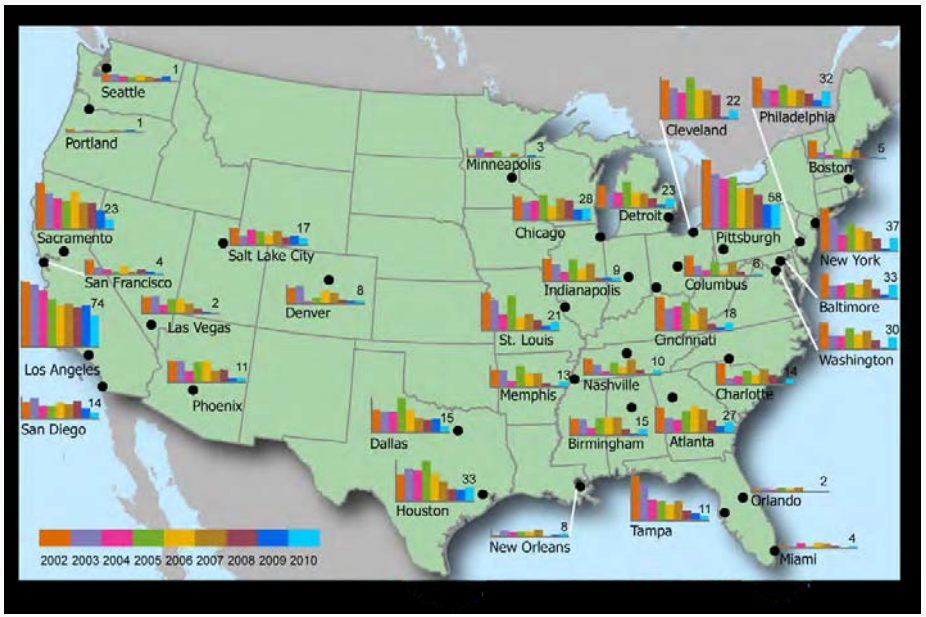
- $PM_{2.5}$: 20,000 to 60,000 cases
- O_3: 1,000 to 4,000 cases

Can vary substantially from year to year due to meteorological influences.

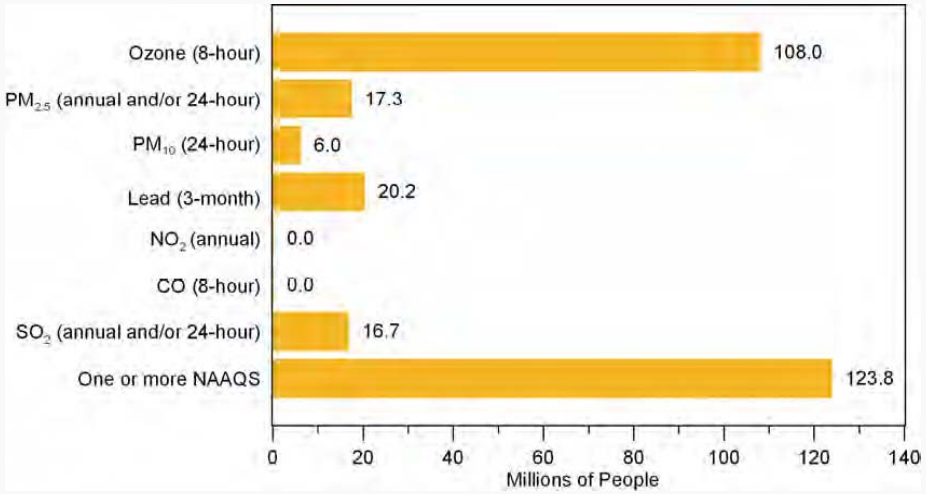
Currently updating this analysis (2002-2011).

Fann N, Risley D. The public health context for $PM_{2.5}$ and ozone air quality trends. Air Quality, Atmosphere and Health, 2011

Despite the large air quality improvements, some challenges remain [4]



While the trend is down, we still see a large number of days in which air quality is unhealthy for sensitive groups in certain major U.S. cities

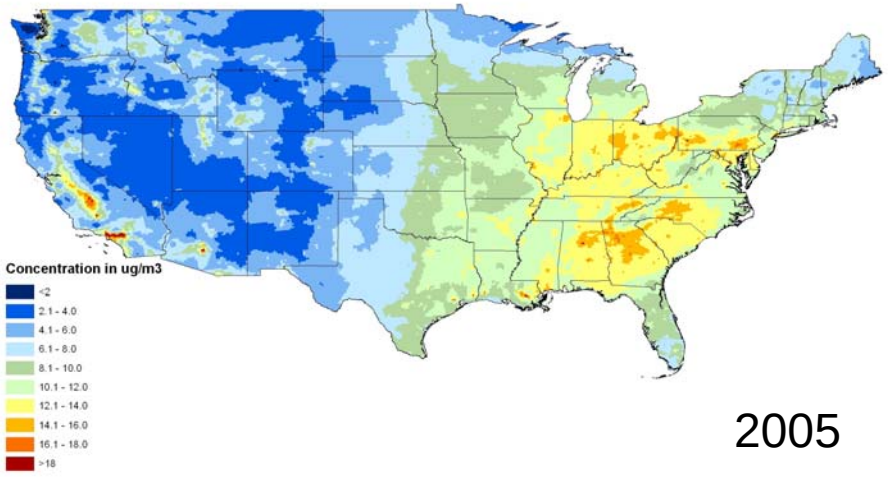


Despite clean air progress, approximately 124 million people lived in counties that had air quality levels above the national standards in 2010

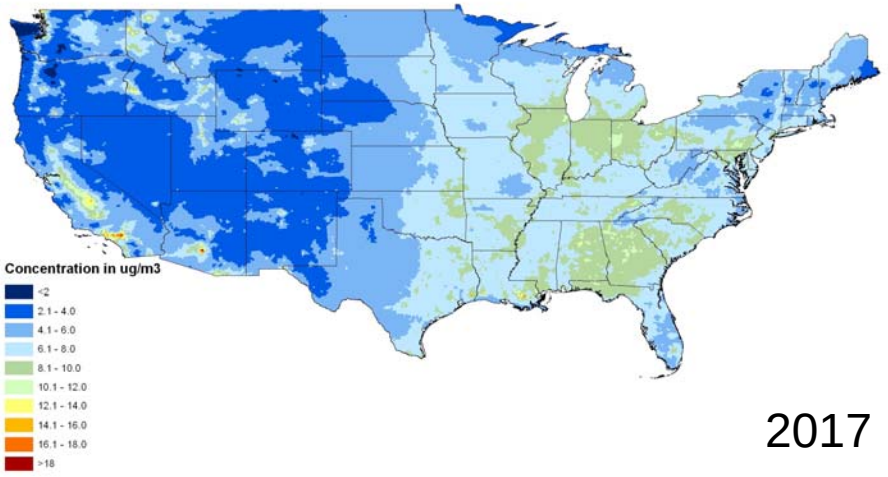
http://www.epa.gov/airtrends

Air quality is expected to show continued improvement over the next decade [5]

Modeled annual average PM2.5 concentrations (µg/m^3)



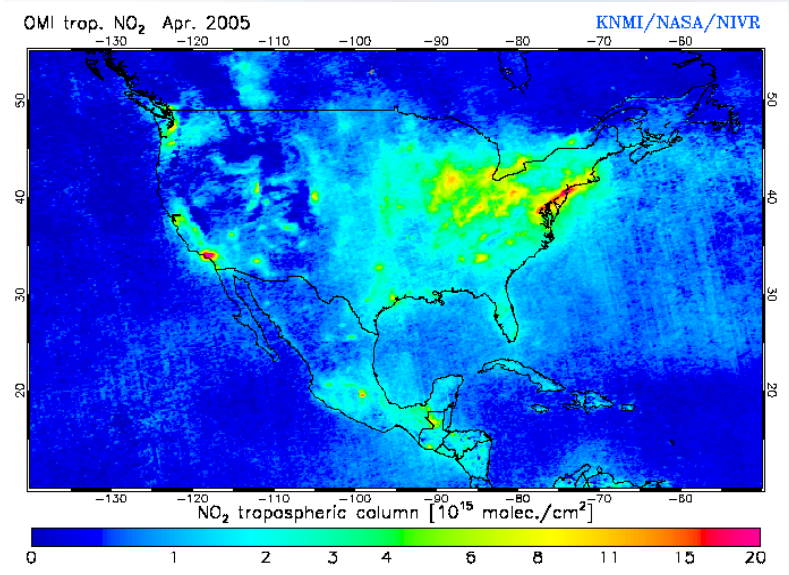
2005

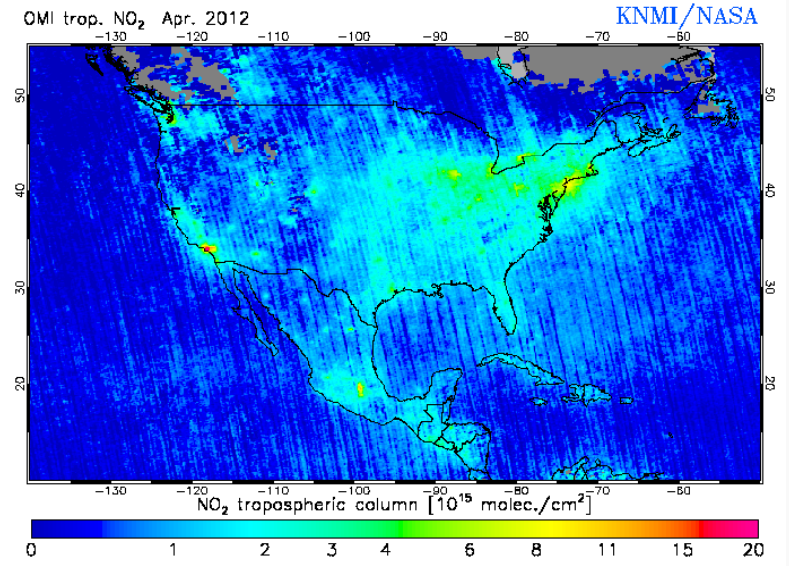


2017

Additional reductions from MATS, CSAPR, and the continuing effects of mobile measures are modeled to result in significant AQ improvements in the next five years

Supporting material for the Mercury and Air Toxics Strategy (MATS) regulatory impact analysis (US EPA, 2012)





Eastern U.S. EGU controls Greatest success story?

Large reduction in EGU emissions between 2005 and 2010 due to ARP programs (CAIR):

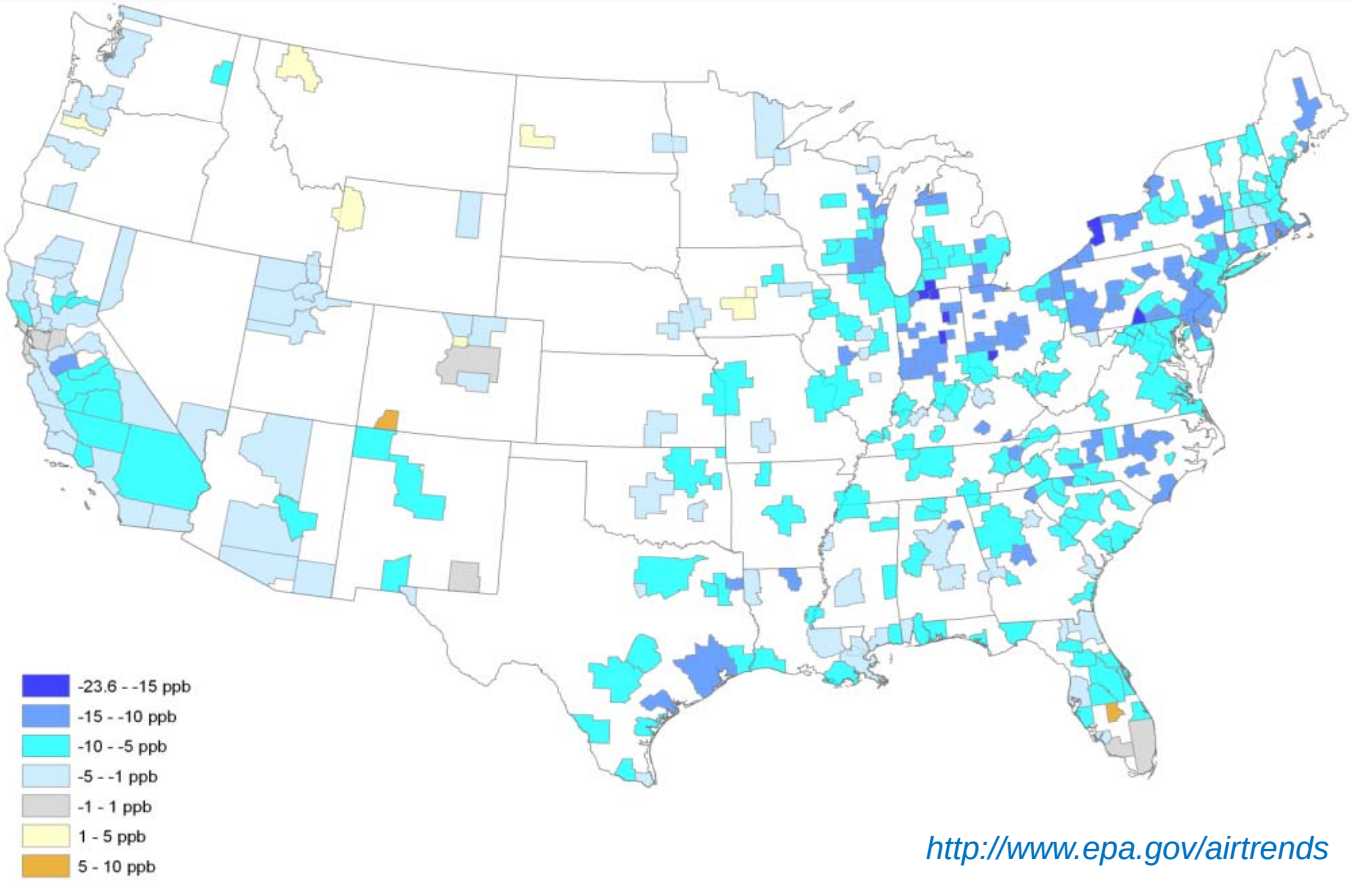
- 50% reduction in EGU SO_2
- 42% reduction in EGU NO_x

These percentage reductions are equivalent to the changes observed from 1990 to 2005.

NOx reductions so significant you can see them from space …

http://www.temis.nl/airpollution/no2.html

Eastern U.S. EGU controls Greatest success story?

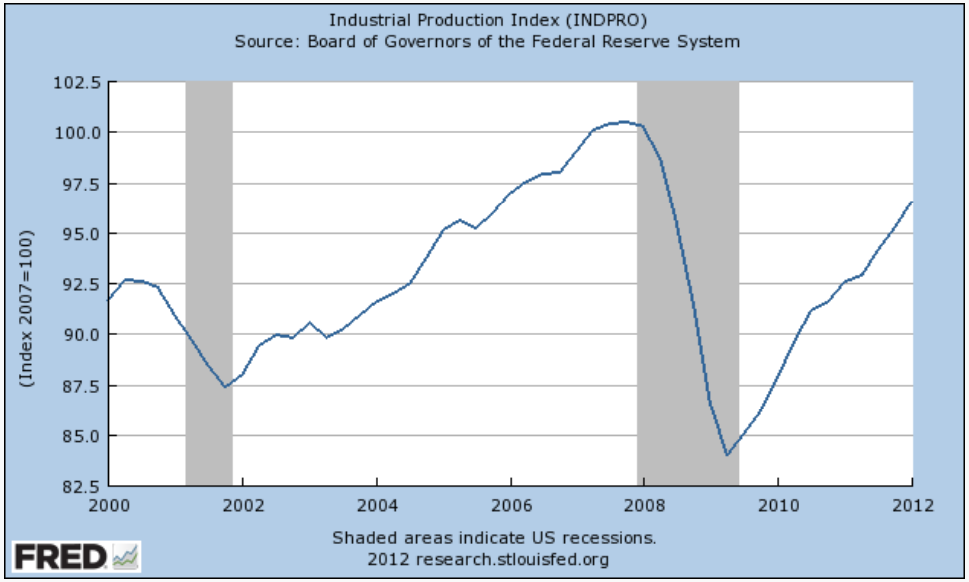


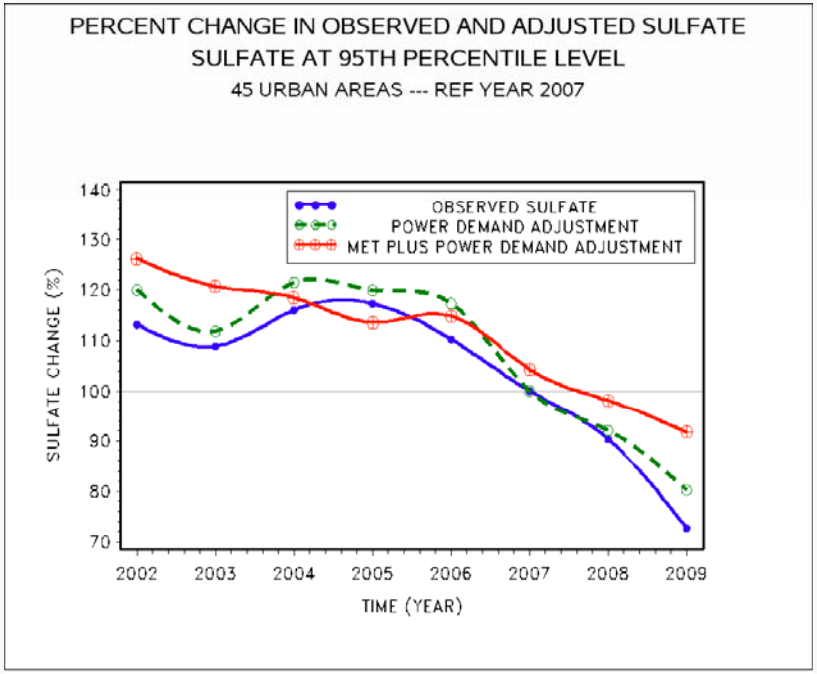
http://www.epa.gov/airtrends

As a result, ozone design values in the eastern U.S. have dropped precipitously over the past decade (5-15 ppb decreases common).

Eastern U.S. annual PM2.5 design values improved by 14%, driven by summer sulfate reductions.

How was air quality affected by the recession?





Analysis concluded that sharp drop in sulfate levels in 2008 and 2009 were driven almost equally by three factors:

- Unfavorable meteorology
- Lower power demand during recession
- Permanent emissions controls

Initial Analysis of Meteorologically Adjusted Sulfate Trend and the Implication of the Recent Economic Slowdown (Chu, 2011)

Available from EPA Air Trends site (special studies)

What do we know about short-term SO_2 trends?

Annual SO_2 means are trending sharply downward:

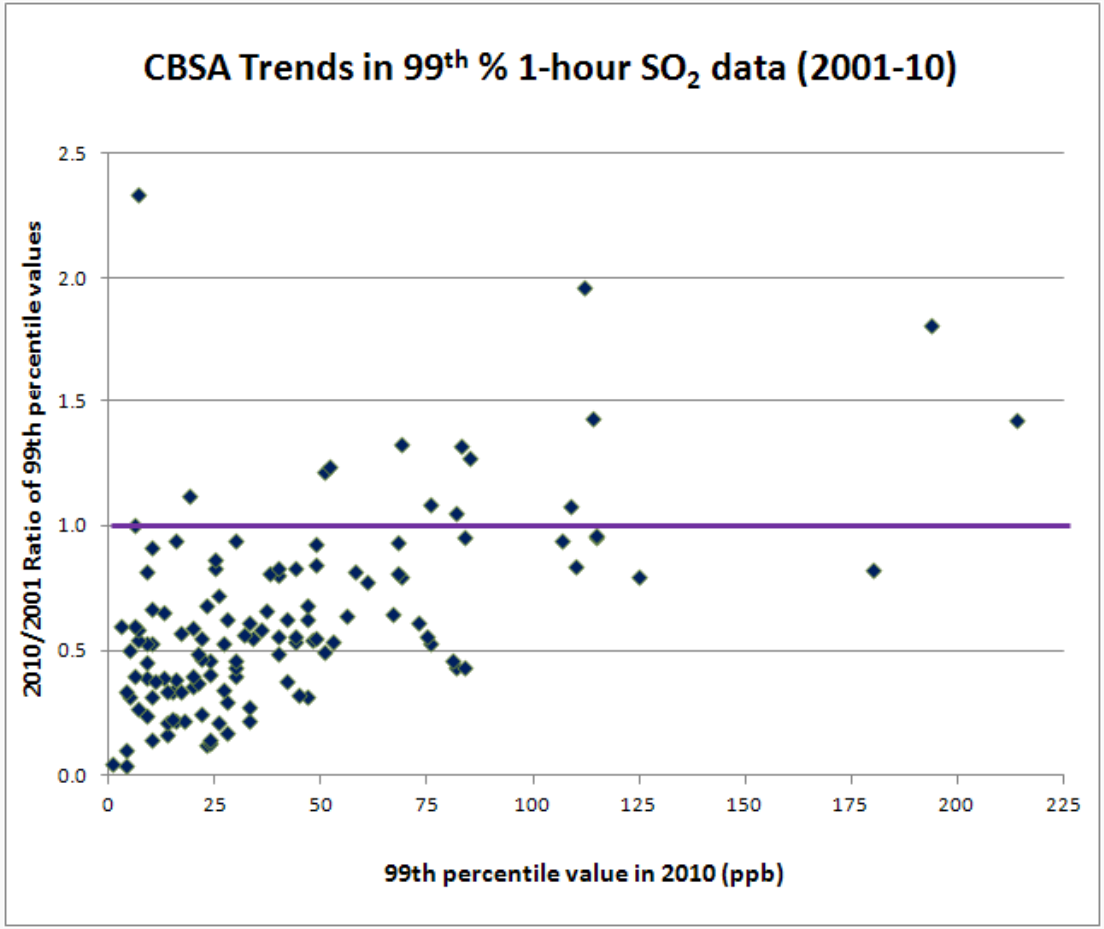
- 60% decrease (2000-2010)

99^{th} percentile SO_2 also has downward trend:

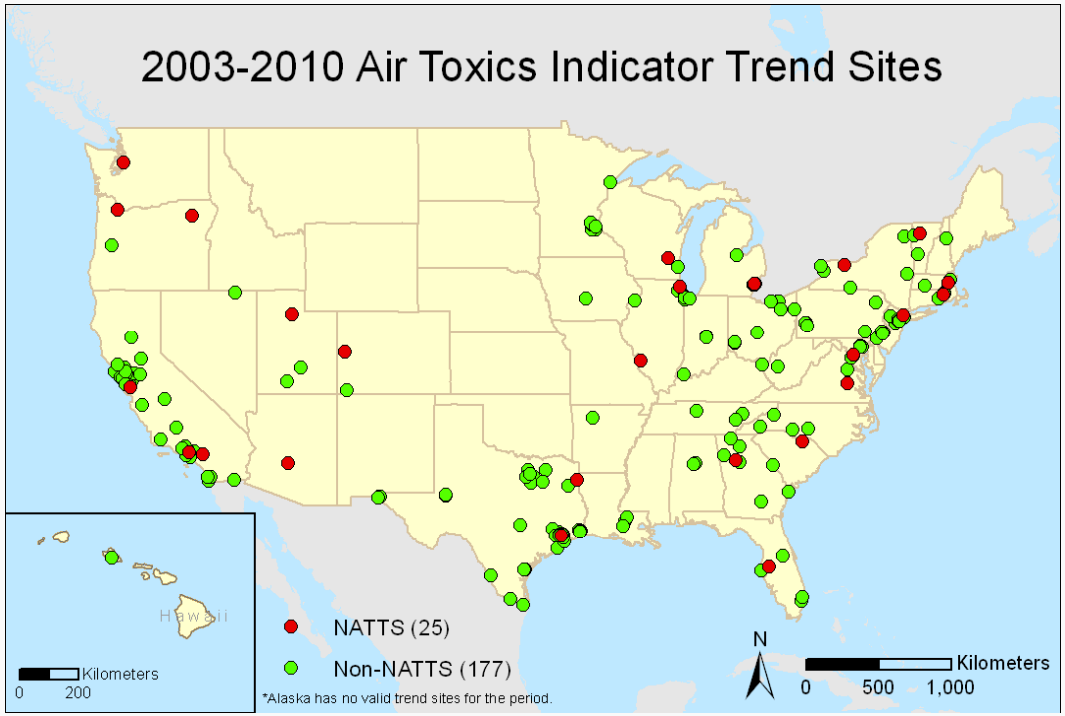
- 41% decrease (2000-2010)

Many of the areas that still violate the 1-hour NAAQS have not experienced improvements since 2001.

http://www.epa.gov/airtrends



What do we know about air toxics trends?



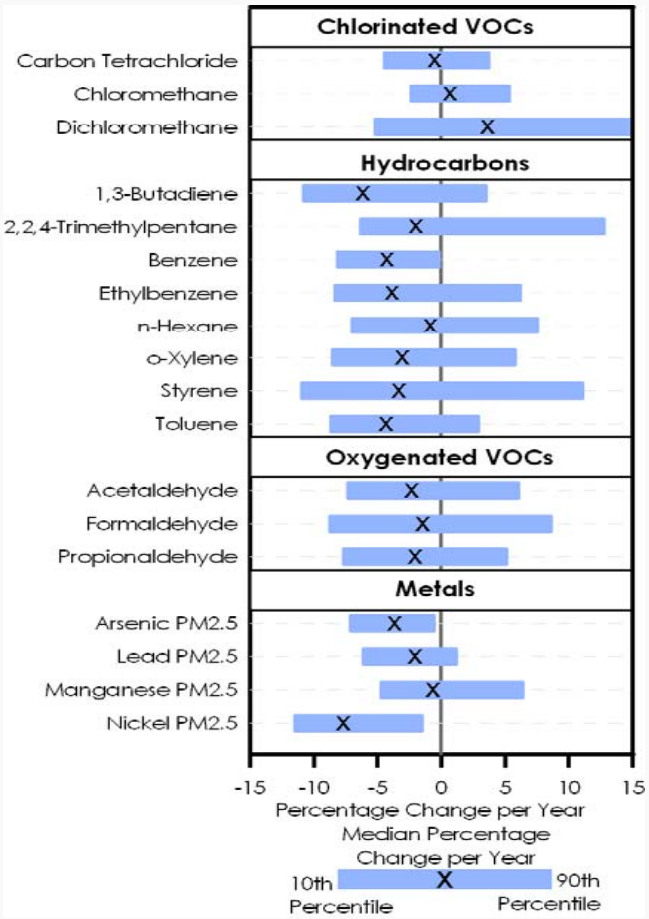
The National Air Toxics Trends Station (NATTS) network was developed to fulfill the need for long-term HAP monitoring data of consistent quality:

- Largely established in 2003-2004
- Urban/rural mix (20/7)

Other State/Local sites meet trend eligibility criteria for specific HAPs can also be assessed.

Preliminary supporting material for the EPA Report on the Environment (US EPA, 2012). Map developed by Sonoma Technology Inc.

What do we know about air toxics trends?



As with the criteria pollutants, HAP trends data show significant reductions over the recent past (2003-2010)

- 17% reduction in acetaldehyde
- 21% reduction in formaldehyde
- 31% reduction in benzene
- 42% reduction in 1-3-butadiene

Aggressive mobile source control programs (e.g., MSAT and other vehicle emissions standards) are thought to have driven some of these reductions.

Trends based on the NATTS network are consistent with the all-site data (shown above & in figure).

Preliminary supporting material for the EPA Report on the Environment (US EPA, 2012). Map developed by Sonoma Technology Inc.

Closing Thoughts

- Trends analyses planned at OAQPS in next 12 months:
  - Analysis focusing on PM2.5 species trends (seasonal/regional)
  - Developing alternative exposure-oriented metrics for ozone trends.
  - Quantifying emission trends and linking to sector-specific regulations

- Monitoring and data analysis communities need to continue to work closely together
  - Must understand data collection methods to fully understand trends
  - Striking balance across differing monitoring objectives

- EPA/OAQPS planning a data analysis workshop in 2013
  - Will be informal and relatively small (invited, active speakers)
  - Please contact me if interested in participating