



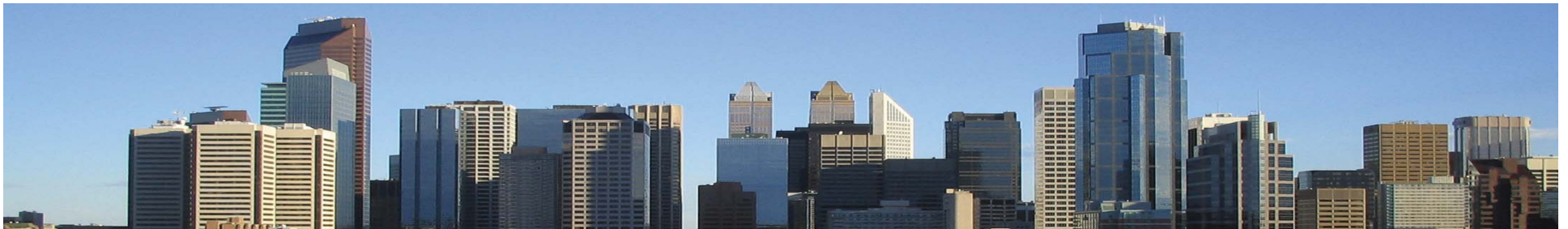
Office of Air Quality Planning and Standards

Updates on the National Ambient Air Quality Standards (NAAQS) and the National Air Toxics Assessment (NATA)

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NACAA Spring Membership Meeting
Sacramento, California
May 18, 2010



Current Schedule for Ongoing NAAQS Reviews

MILESTONE	POLLUTANT						
	NO ₂ Primary	SO ₂ Primary	Ozone Reconsideration	CO	PM	NO ₂ /SO ₂ Secondary	Lead
NPR	<u>Jun 26, 2009</u>	<u>Nov 16, 2009</u>	Jan 6, 2010	<u>Oct 28, 2010</u>	Feb 2011	<u>July 12, 2011</u>	Nov 2013
NFR	<u>Jan 22, 2010</u>	<u>Jun 2, 2010</u>	Aug 31, 2010	<u>May 13, 2011</u>	Oct 2011	<u>Mar 20, 2012</u>	Sept 2014

NOTE:

Underlined dates indicate court-ordered or settlement agreement deadlines

Next Ozone Review: Proposal in May 2013 and Final in Feb 2014

Reconsideration of 2008 Ozone NAAQS



- Proposal signed on January 6, 2010
 - Reconsiders the 2008 decision to set identical primary and secondary 8-hour ozone standards at a level of 0.075 ppm
 - The reconsideration is based on the scientific and technical record used in the 2008 review, which included > 1,700 scientific studies
- 3 Public hearings
- Public comments: > 5,000 comments
 - Government agencies
 - Industry and related associations
 - Public health and environmental groups
 - Private citizens
- Final Rule to be signed by August 31, 2010

Proposed Reconsideration of Primary Ozone Standard

- Proposed to set the 8-hour primary standard at a level within the range of 0.060-0.070 parts per million (ppm), based on:
 - Evidence from clinical studies showing a broad array of effects in healthy adults (e.g., decreased lung function, respiratory symptoms)
 - Evidence from clinical and epidemiological studies indicating that people with asthma are likely to experience larger and more serious effects than healthy people
 - Epidemiological evidence indicating associations for a wide range of serious health effects, including respiratory-related emergency department visits and hospital admissions and risk of premature mortality, that extend well below the current standard level
 - Estimates from the risk and exposure assessment indicating that important improvements in public health could be achieved by a standard set within this range

Proposed Reconsideration of Secondary Ozone Standard

- Proposed a distinct secondary standard based on a cumulative, seasonal index known as the W126, at a level in the range of 7-15 ppm-hours
 - This cumulative standard would add peak-weighted hourly ozone concentrations over 12 daylight hours per day across all days in a three-month period during the ozone season
 - This form is designed to account for the cumulative effects of repeated ozone exposures on sensitive vegetation during the three months of the year when cumulative ozone levels are highest

Reconsidering the Ground-Level Ozone Standards

- Proposal is consistent with the recommendations of EPA's Clean Air Scientific Advisory Committee (CASAC)
 - The 2008 ozone standards were not as protective as recommended by CASAC
 - In April 7, 2008 letter to the Agency, CASAC expressed concern over the 2008 final rule:
 - “[T]he members of the CASAC Ozone Review Panel do not endorse the new primary ozone standard [of 0.075 ppm] as being sufficiently protective of public health....”
 - “The CASAC sincerely hopes that, in the next round of Ozone NAAQS review, the Agency will be able to support and establish a reasonable and scientifically-defensible cumulative form for the secondary standard.”



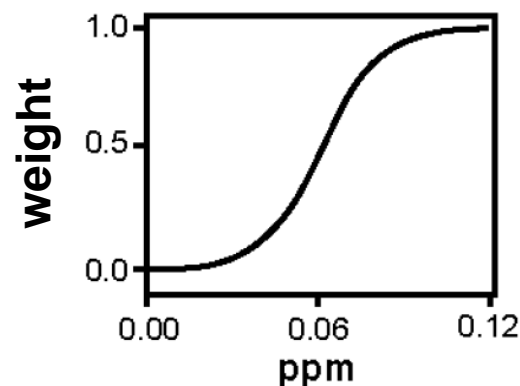
Ozone and the Environment

- Ground-level ozone is absorbed by the leaves of plants, where it can:
 - Interfere with the ability of sensitive plants to produce and store food, leading to reduced growth, biomass production and yields
 - Make sensitive plants more susceptible to certain diseases, insects, harsh weather, other pollutants, and competition
 - Reduce or change plant species diversity in associated ecosystems
 - Visibly injure the leaves of plants, affecting the appearance of vegetation in national parks, recreation areas and cities

Understanding the W126 Proposed Secondary Standard

Steps in calculating W126 value for a particular site:

1. Measure hourly ozone (O₃) concentrations for each hour within the 12 hour daylight period (8am-8pm).
2. Assign a weight to each hourly value based on concentration: lower concentrations receive less weight than higher concentrations.
3. Sum the 12 weighted hourly values to calculate a daily W126 value.
4. Repeat steps 1-3 for each day within the ozone season and then sum the daily values to calculate the monthly W126 value.
5. Identify the consecutive 3-month period whose monthly W126 values produce the highest total. This total becomes the seasonal W126 for this site.
6. Average three years of maximum W126 values and compare to standard.



Example of weighting over 5-hour period:

Hourly O ₃ (ppm)	Weight	W126 (ppm-hrs)
0.03	0.01	0.00
0.05	0.11	0.01
0.06	0.30	0.02
0.08	0.84	0.07
0.10	1.0	0.10

SUM: 0.20

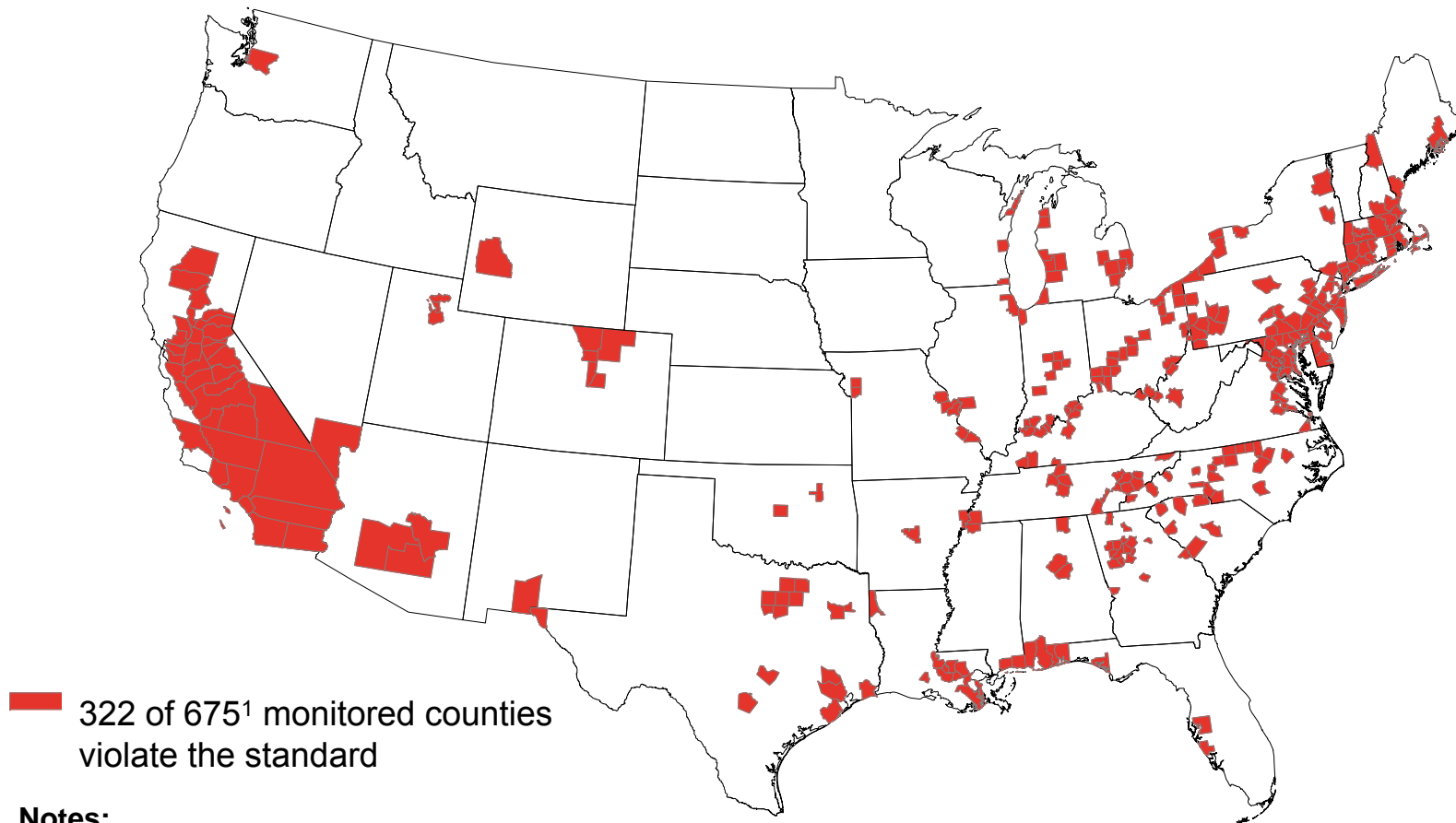
Daily value =
Sum of values over 12 daylight hours

Estimated Number of Adverse Health Effects Avoided under Alternate Standard Levels in 2020*

	0.070 parts per million	0.060 parts per million
Chronic bronchitis	880	2,200
Nonfatal heart attacks	2,200	5,300
Hospital and emergency room visits	6,700	21,000
Acute bronchitis	2,100	5,300
Upper and lower respiratory symptoms	44,000	111,000
Aggravated asthma	23,000	58,000
Days when people miss work or school	770,000	2.5 million
Days when people must restrict their activities	2.6 million	8.1 million
Avoided premature mortality	1,500 to 4,300	4,000 to 12,000

*Includes benefits of reduced fine particle concentrations associated with illustrative ozone controls applied to meet a primary ozone standard in the proposed range

Counties With Monitors Violating the March 2008 Ground-Level Ozone Standards 0.075 parts per million (Based on 2006 – 2008 Air Quality Data)



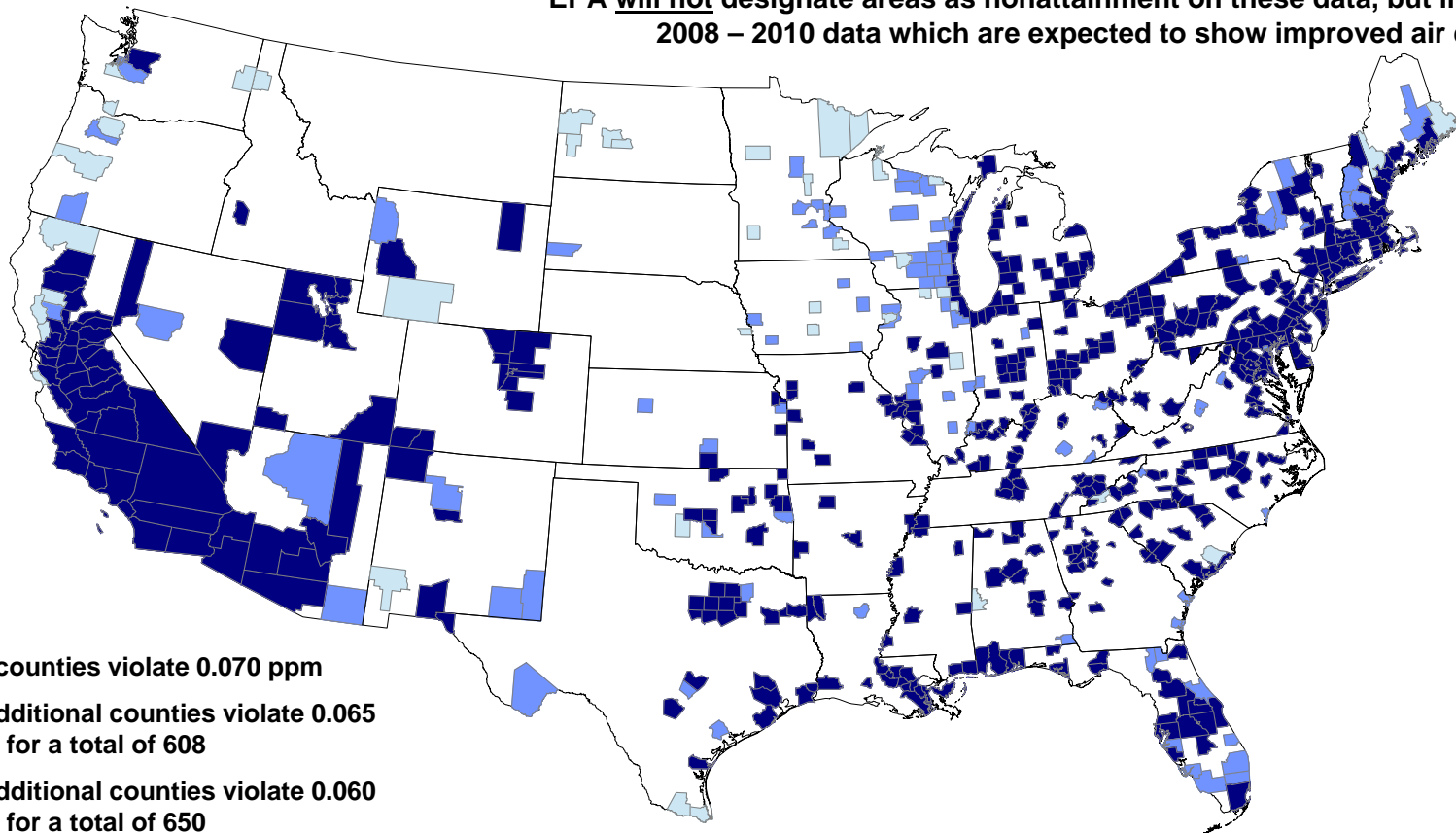
Notes:

1. Counties with at least one monitor with complete data for 2006 – 2008
2. To determine compliance with the March 2008 ozone standards, the 3-year average is truncated to three decimal places.

Counties With Monitors Violating Proposed Primary 8-hour Ground-level Ozone Standards of 0.060 - 0.070 parts per million

(Based on 2006 – 2008 Air Quality Data)

EPA will not designate areas as nonattainment on these data, but likely on 2008 – 2010 data which are expected to show improved air quality.



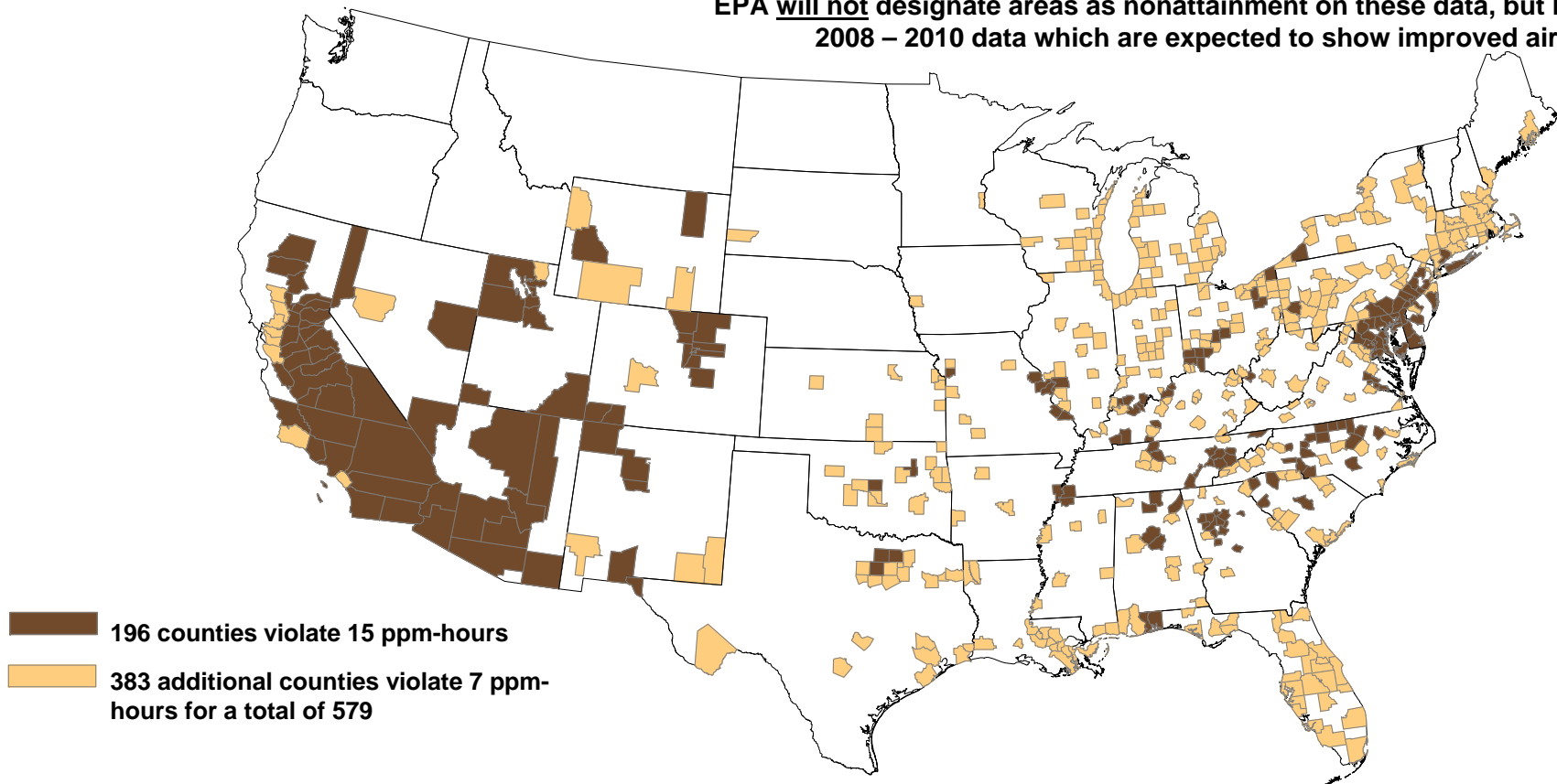
Notes:

1. No monitored counties outside the continental U.S. violate.
2. EPA is proposing to determine compliance with a revised primary ozone standard by rounding the 3-year average to three decimal places.

Counties With Monitors Violating Proposed Secondary Seasonal Ground-Level Ozone Standards of 7 – 15 parts per million-hours

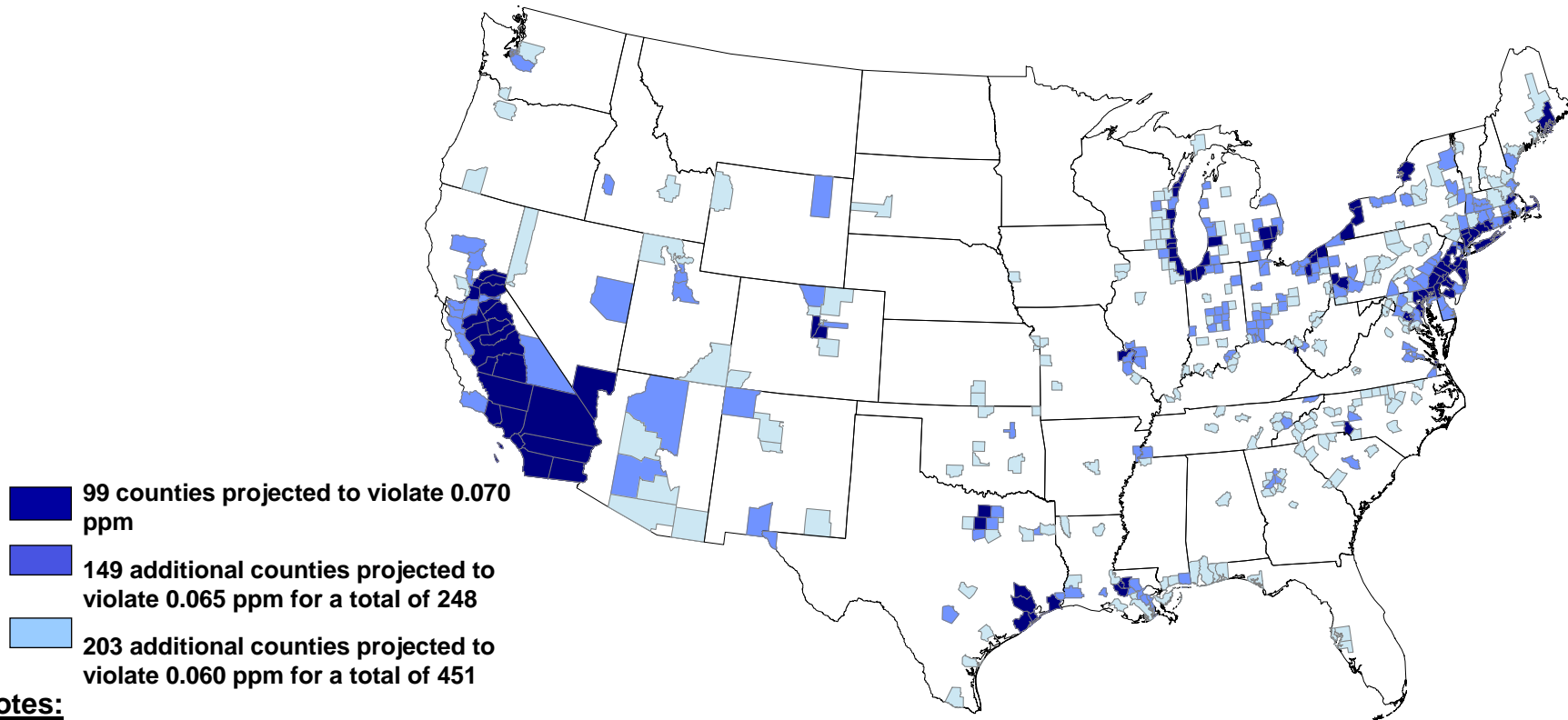
(Based on 2006 – 2008 Air Quality Data)

EPA will not designate areas as nonattainment on these data, but likely on 2008 – 2010 data which are expected to show improved air quality.



No monitored counties outside the continental U.S. violate.

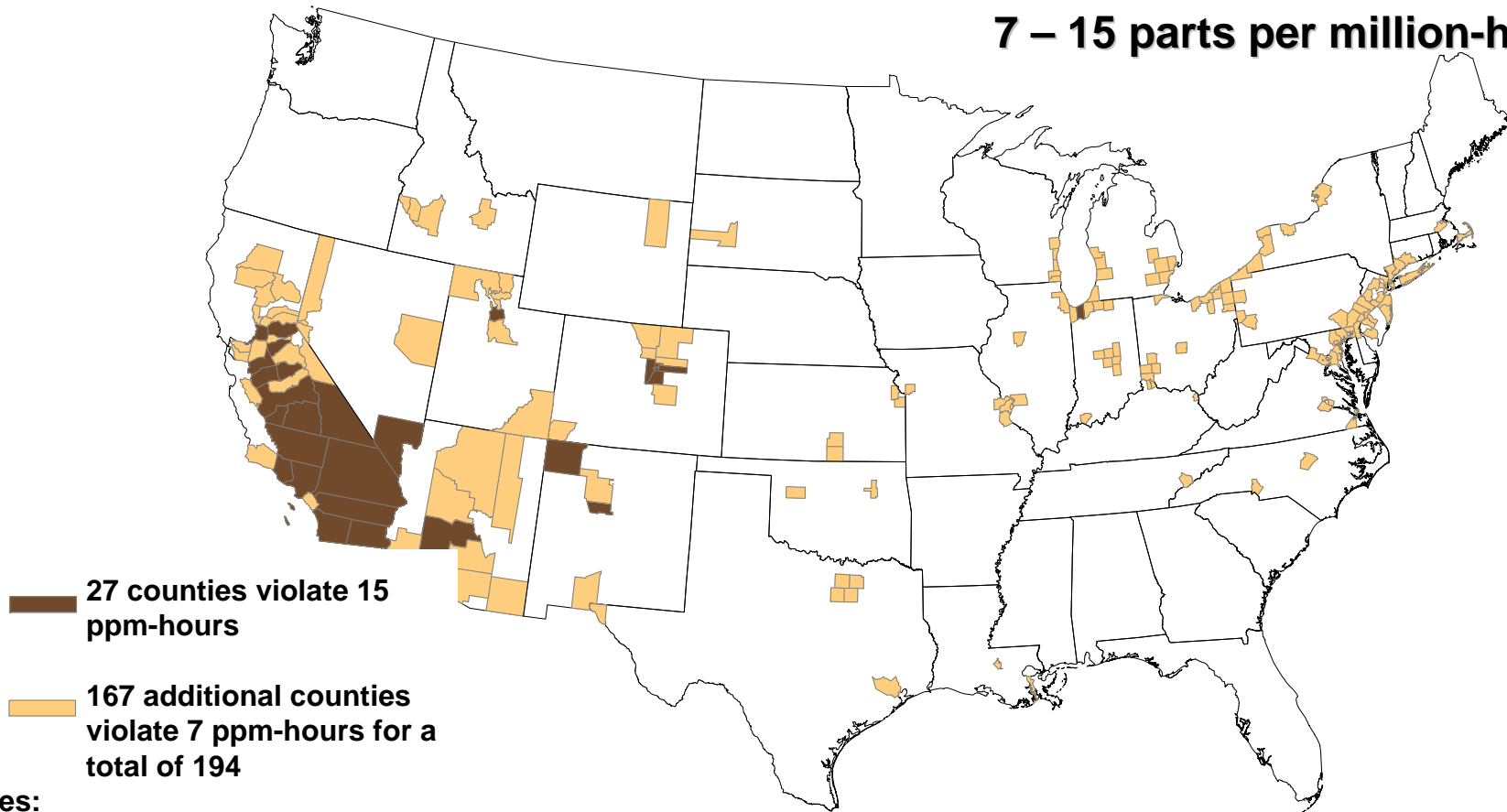
Counties With Monitors Projected to Violate the Proposed Primary 8-hour Ground-Level Ozone Standards in 2020 0.060 - 0.070 parts per million



Notes:

1. The modeled emissions in 2020 reflect the expected emissions reductions from federal programs by 2020 including: the Clean Air Interstate Rule, the Clean Air Mercury Rule, the Clean Air Visibility Rule, the Clean Air Nonroad Diesel Rule, the Light-Duty Vehicle Tier 2 Rule, the Heavy Duty Diesel Rule, the proposed rules for Locomotive and Marine Vessels and for Small Spark-Ignition Engines, and an estimate of State-level mobile and stationary source controls that were projected to be needed to attain pre-existing PM 2.5 and ozone standards.
2. Controls applied are illustrative. States may choose to apply different control strategies for implementation.
3. EPA did not model future violations outside the continental U.S.
4. EPA is proposing to determine compliance with a revised primary ozone standard by rounding the 3-year average to three decimal places.

Counties With Monitors Projected to Violate the Proposed Secondary Seasonal Ground-level Ozone Standards in 2020 7 – 15 parts per million-hours



Notes:

1. The modeled emissions in 2020 reflect the expected emissions reductions from federal programs by 2020 including: the Clean Air Interstate Rule, the Clean Air Mercury Rule, the Clean Air Visibility Rule, the Clean Air Nonroad Diesel Rule, the Light-Duty Vehicle Tier 2 Rule, the Heavy Duty Diesel Rule, the proposed rules for Locomotive and Marine Vessels and for Small Spark-Ignition Engines, and an estimate of State-level mobile and stationary source controls that were projected to be needed to attain pre-existing PM 2.5 and ozone standards.
2. Controls applied are illustrative. States may choose to apply different control strategies for implementation.
3. EPA did not model future violations outside the continental U.S.

PM NAAQS



- In October 2006, EPA:
 - Revised level of 24-hour $PM_{2.5}$ standard from 65 to 35 $\mu\text{g}/\text{m}^3$
 - Retained annual $PM_{2.5}$ standard at 15 $\mu\text{g}/\text{m}^3$
 - Retained 24-hour PM_{10} standard to address coarse particles ($PM_{10-2.5}$); revoked PM_{10} annual standard
 - Set secondary standards identical to primary
- CASAC expressed serious concerns with some aspects of final rule; decisions were not consistent with CASAC advice
- EPA did not adjust the PM AQI in 2006; intended to issue a separate rule

PM NAAQS Final Rule Remand

- Feb 2009: D.C. Circuit Court remanded portions of final rule
- Court concluded EPA failed to adequately explain why primary annual PM_{2.5} standard is sufficient to protect public health with an adequate margin of safety. Remanded for further consideration of whether it provides:
 - Adequate margin of safety for both long- and short-term exposures
 - Adequate margin of safety against morbidity in children and other vulnerable subpopulations
- Court concluded decision to set secondary PM_{2.5} standards identical to primary standards was unreasonable and contrary to the law
- Secondary standards remanded for reconsideration

Current PM NAAQS Review

- Integrated Science Assessment (ISA)
 - Finalized December 2009
- Risk and Exposure Assessments
 - To be finalized in May/June 2010
- Policy Assessment
 - First draft reviewed by CASAC on April 8-9 and May 7, 2010
 - Second draft to CASAC and public by late June 2010
 - Final document planned to be issued in September 2010
- Proposed rulemaking –February 2011
- Final rulemaking –October 2011
- For more information:

http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html

Primary PM Standards: Integrated Science Assessment (ISA)

- Extensive new health evidence available on PM_{2.5}, including epidemiological studies of short- and long-term exposures; more limited data for PM_{10-2.5} and ultrafine particles
- Weight of evidence judgments in the ISA:
 - PM_{2.5}
 - A causal relationship exists between long-/short-term exposures and cardiovascular effects and mortality
 - A causal relationship is likely to exist between long-/short-term exposures and respiratory effects
 - Evidence is suggestive of a causal relationship between long-term exposure and cancer and developmental effects
 - PM_{10-2.5}
 - Evidence is suggestive of a causal relationship between short-term exposures and cardiovascular effects, respiratory effects, and mortality
 - Ultrafine particles
 - Evidence is suggestive of a causal relationship between short-term exposures and cardiovascular and respiratory effects

Primary PM_{2.5} Standards: Draft Policy Assessment

- Adequacy of the current PM_{2.5} standards
 - Associations with mortality/morbidity have been reported in locations that would meet the current PM_{2.5} standards
- Indicators
 - Staff finds support for maintaining a PM_{2.5} mass-based indicator
 - Staff finds insufficient evidence for health effects associated with ultrafine particle exposures and on the relative toxicity of some PM_{2.5} components to support consideration for alternative indicators at this time
- Level
 - Preliminary staff conclusions:
Appropriate to consider setting the levels of the annual and 24-hour standards such that the annual standard would be the “generally controlling” standard to provide protection for both long- and short-term PM_{2.5} exposures in conjunction with a 24-hour standard to provide supplemental protection against days with high peak concentrations associated with localized “hotspots” and risk arising from seasonal emissions that might not be well controlled by a national annual standard.
 - Levels appropriate to consider:
 - Annual PM_{2.5} standard: 10-13 µg/m³
 - 24-hour PM_{2.5} standard: 25-35 µg/m³

Primary Coarse Particle Standards: Draft Policy Assessment

- Adequacy of the current PM₁₀ standards
 - Associations with mortality/morbidity have been reported in locations that would meet the current PM₁₀ standards
 - However, the number of health studies and air quality data in such locations are limited; the extent to which thoracic coarse particles themselves contribute to the reported health effects remains uncertain
- Indicator
 - First draft PA discusses both the continued use of PM₁₀ and the adoption of PM_{10-2.5} as potential options for indicator
- Levels
 - Second draft PA will consider ranges of potential alternative standard levels

Secondary PM Standards: ISA



- Weight of evidence judgments in the ISA
 - A causal relationship exists between PM and visibility impairment
 - A causal relationship exists between PM and effects on climate, including both direct effects on radiative forcing and indirect effects that involve cloud feedbacks that influence precipitation and cloud lifetimes
 - A causal relationship exists between PM and effects on materials
 - A causal relationship is likely to exist between deposition of PM and a variety of effects on individual organisms and ecosystems

Secondary PM Standards: Draft Policy Assessment



- Adequacy of the current PM standards
 - Currently available information calls into question the adequacy of the current standards, primarily in urban areas, and supports consideration of a distinct secondary standard to provide appropriate protection
- Indicator
 - Assessing different indicators (e.g., light extinction, PM mass) related to visibility impairment as basis for distinct secondary standard
- Averaging time
 - Considering 1-hour averaging time
- Level
 - Considering a range of potential alternative standard levels based on results from an analysis of visibility preference studies

Preliminary CASAC Comments on First Draft Policy Assessment for PM

- CASAC panel members support general approaches used to evaluate:
 - Adequacy of current standards
 - Alternative standards to consider
- Generally support continued use of PM_{2.5} and PM₁₀ indicators for primary standards
 - Express strong support for additional research and data collection efforts on particle sizes and composition to inform future reviews
- Support proposed PM light extinction indicator or alternative PM_{2.5} mass-based indicator for distinct secondary standards
- Specific comments will help EPA further refine and streamline discussions and draft staff conclusions in second draft PA

PM_{2.5} AQI

- EPA plans to propose revisions to the AQI when we issue a PM NAAQS proposal (February 2011)
- In the interim, using 35 µg/m³ as the AQI value of 100 (the breakpoint between codes yellow and orange)
 - EPA has made this change on the AIRNow Web site
- Guidance issued in Sept 2009 recommended that States consider using alert, warning, emergency and significant harm levels consistent with the AQI levels presented in the February 2007 issue paper
 - AQI 200 = Alert Level = 140.5 - 210.4 µg/m³
 - AQI 300 = Warning Level = 210.5 – 280.4 µg/m³
 - AQI 400 = Emergency Level = 280.5 – 350.4 µg/m³
 - AQI 500 = Significant Harm Level (SHL) = 350.5 µg/m³
- For those with authority to do so, EPA will accept the use of AQI breakpoints that are consistent this guidance

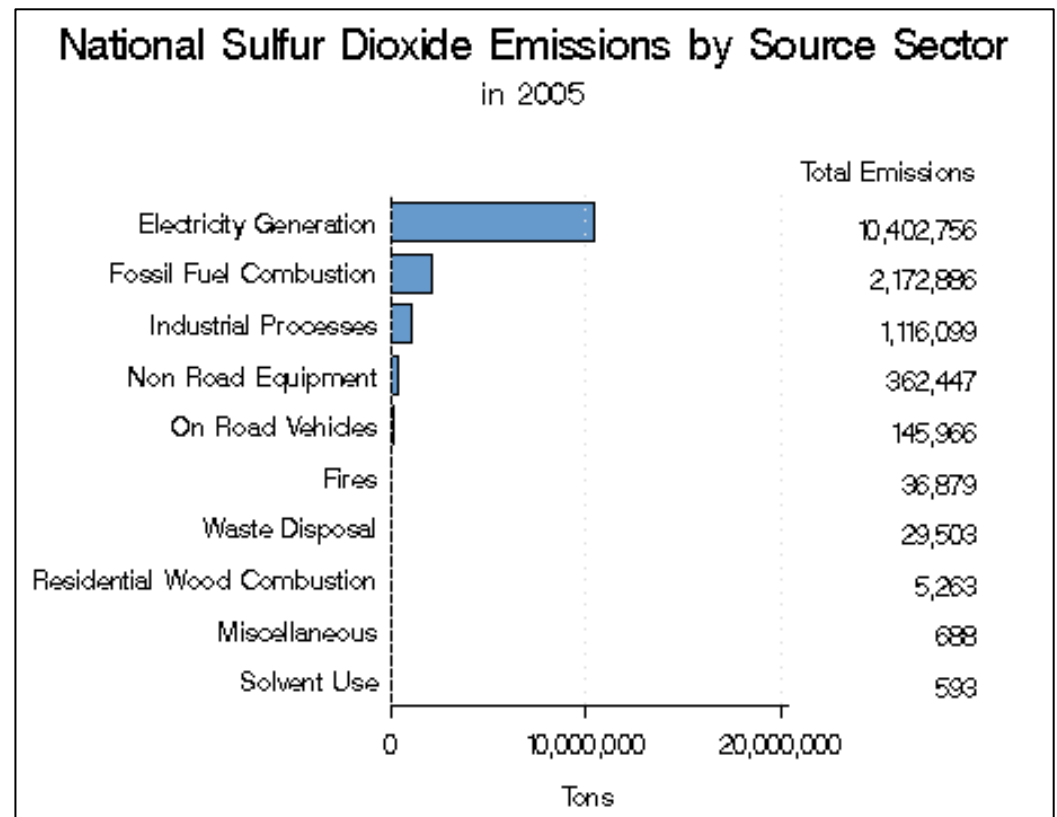


SO₂ NAAQS

- November 16, 2009: EPA proposed to strengthen primary standards for sulfur dioxide (SO₂) to improve public health protection
 - Proposed new 1-hour SO₂ standard at level between 50-100 ppb to reduce people's exposure to high short-term concentrations of SO₂
 - Would replace existing annual and 24-hour primary SO₂ standards set in 1971
- New scientific studies provide stronger evidence of link between short-term SO₂ exposures, ranging from 5 minutes to 24 hours, and adverse respiratory outcomes, including:
 - Narrowing of the airways leading to difficulty breathing (bronchoconstriction)
 - Increased asthma symptoms, especially during exercise
 - Emergency-department visits and hospital admissions for respiratory illnesses
 - Children, the elderly and asthmatics are among the most at-risk populations
- EPA's proposal is consistent with CASAC recommendations
- The final rule will be signed no later than June 2, 2010
- For more information, go to <http://www.epa.gov/air/urbanair/so2>

Sources of SO₂ Pollution

- Fossil fuel combustion at power plants (66%) and other industrial facilities (29%) are the main sources of SO₂ emissions
- Other sources include industrial processes such as extracting metal from ore, and the burning of high sulfur fuels by locomotives, large ships, and non-road equipment

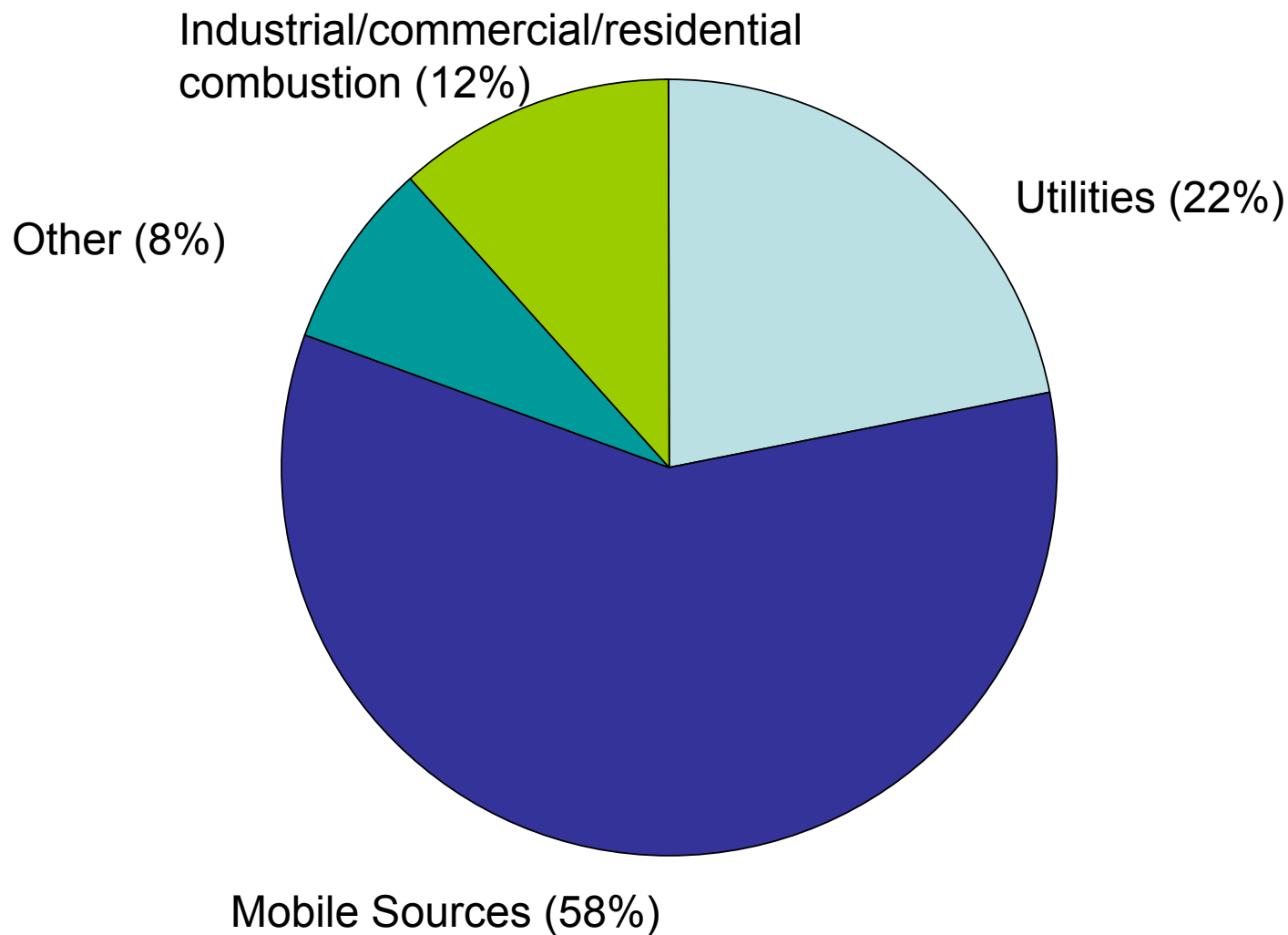




NO₂ NAAQS

- On January 22, 2010 EPA strengthened the primary nitrogen dioxide (NO₂) standards to increase public health protection
 - Added a **1-hour** NO₂ standard at 100 parts per billion (ppb); and
 - Retained the **annual** average NO₂ standard at a level of 53 ppb
- This suite of primary standards will:
 - Limit short-term exposures to peak NO₂ concentrations, which often occur near major roads and could worsen asthma symptoms
 - Maintain community-wide NO₂ concentrations below levels associated with respiratory related emergency department visits and hospital admissions
- Revised NO₂ standards reflect the maximum allowable NO₂ concentrations anywhere in an area
 - In many locations, maximum concentrations likely to occur around roads
 - Some monitors will be located to focus on vulnerable and susceptible groups
- For more information go to <http://www.epa.gov/air/nitrogenoxides>

Sources of NO_x Pollution



NO_x SO_x Secondary NAAQS Review



- Integrated Science Assessment
 - Finalized December 2008
- Risk and Exposure Assessments
 - Finalized September 2009
- Policy Assessment
 - First draft reviewed by CASAC in April 2010
 - CASAC recommendations letter finalized May 3, 2010
 - Second draft PA to be released for CASAC and public review end of July 2010
- Proposed rulemaking – July 2011
- Final rulemaking – March 2012
- For more information:

<http://www.epa.gov/ttn/naaqs/standards/no2so2sec/index.html>

Why is EPA Conducting a Multipollutant NO_x SO_x Review?

- National Research Council report *Air Quality Management in the United States* (2004) recommended:
 - EPA should consider multiple pollutants in developing the scientific basis for NAAQS
 - EPA should enhance protection of ecosystems and other aspects of public welfare, in part by building an improved basis for implementing secondary standards
- Joint NO_x SO_x review builds upon EPA's and CASAC's past recognition of the interactions between these pollutants and on the growing body of scientific information re: associated ecological effects

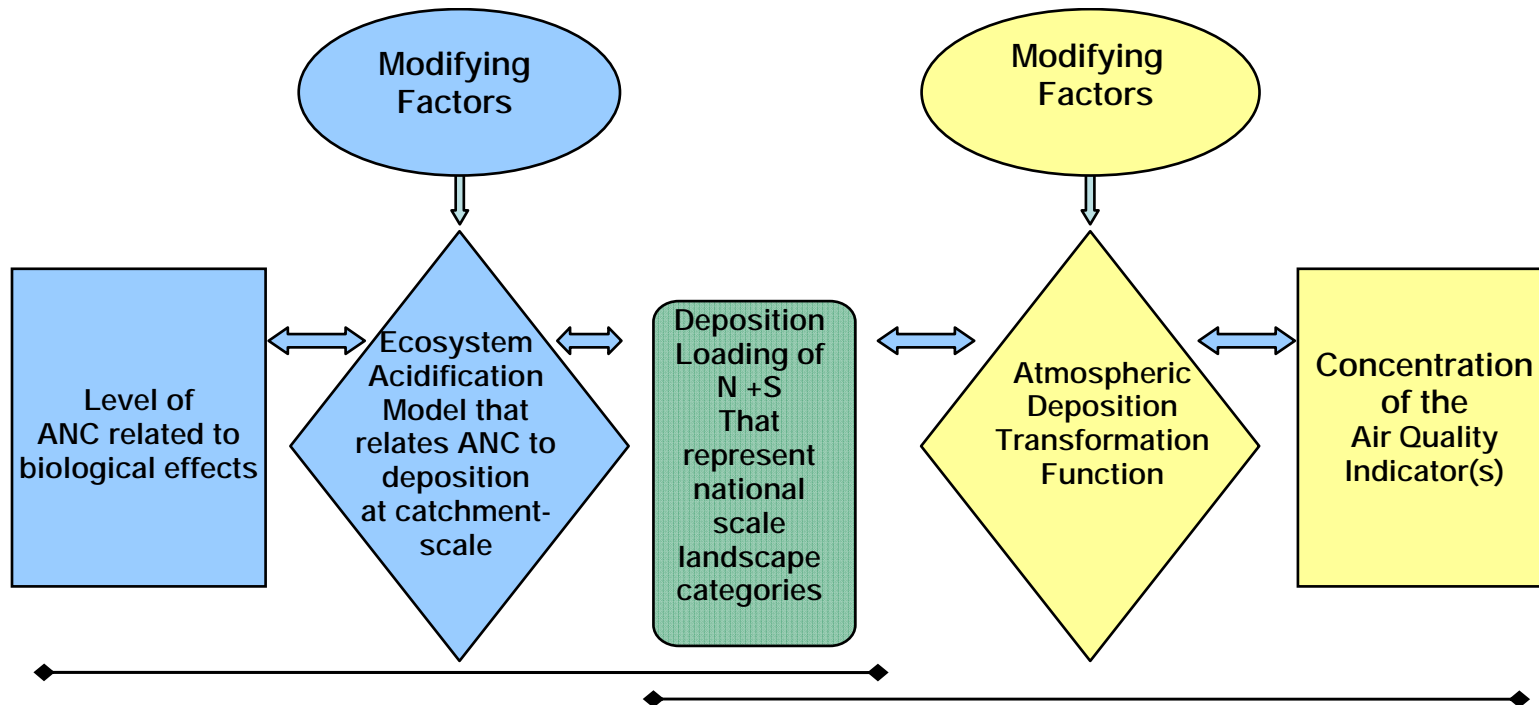
Key Elements of the NO_x SO_x Secondary NAAQS Policy Assessment

- Strong evidence for effects from deposition of NO_x and SO_x on acidification in freshwater aquatic ecosystems (lakes and streams)
 - Linked to ecosystem effects including losses in fish diversity and populations
- Drafted framework for combined NO_x and SO_x standard that reflects the relative contribution of each pollutant to aquatic acidification
 - Also accounts for the differing sensitivity of ecosystems to acidification due to underlying ecosystem characteristics such as bedrock geology
- Under draft framework, standards for NO_x and SO_x would be expressed through index called Atmospheric Acidification Potential Index (AAPI)
 - AAPI linked to a target level of ecosystem protection
 - Specifically, AAPI determines the combinations of NO_x and SO_x that will jointly result in a level of acidification in a population of water bodies which protects against adverse effects

CASAC Comments on First Draft NO_x SO_x Secondary NAAQS Policy Assessment

- Agreed with finding that current standards are not adequate to protect against ecosystem impacts, and that a new form would be necessary
 - Supported both general proposed framework for the standards as well as the specific approach suggested for developing the AAPI
- Proposed conceptual framework well thought-out and innovative in design
 - Helps address complex linkages between various components (ecological effects, aquatic chemistry, atmospheric wet and dry deposition, and atmospheric concentrations of NO_x and SO_x)

NOx SOx Secondary: Conceptual Design



Relationship between the amount of deposition and the effect on the selected ecological indicator, ANC (described in 5.2)

Relationship between the amount of deposition and the concentration of NOx and SOx (described in 5.4)

Effects of deposition on ecosystem

Total deposition entering ecosystem

Relationship between atmospheric concentration and deposition



NO_x SO_x Secondary NAAQS Review: Next Steps

- Second draft Policy Assessment focused on improving the specification of elements of the standards, and ensuring that the standards can be applied nationally
- Also exploring how the role of reduced forms of nitrogen (ammonia) can be addressed in the standards
 - Members of CASAC have repeatedly expressed concern about the effects of ammonia on ecological systems and requested that EPA consider it as part of this NAAQS review



CO NAAQS

- Integrated Science Assessment– completed January 2010
- Final Risk and Exposure Assessment– May 28, 2010
- Final Policy Assessment– early Summer 2010
- Proposed Rule– October 28, 2010
- Final Rule– May 13, 2011

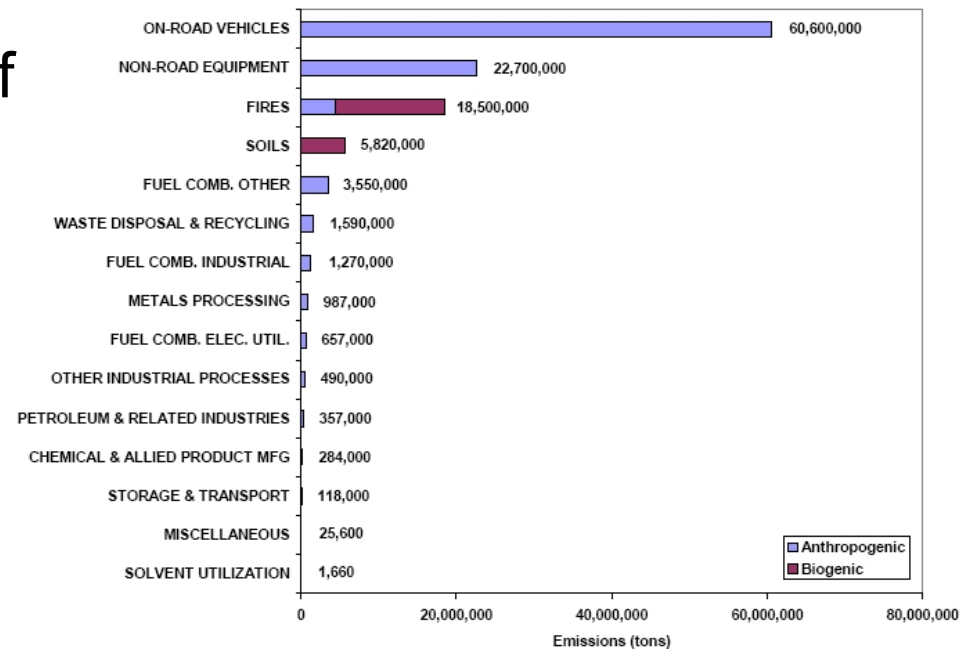
CO NAAQS: Current Standards

- Two existing primary CO standards:
 - 9 ppm, 8-hr average
 - 35 ppm 1-hr average
 - Standards not to be exceeded more than once per year
- There is no secondary standard for CO



Sources of CO Pollution

- CO formed primarily by incomplete combustion of carbon-containing fuels and photochemical reactions in the atmosphere
- On-road mobile sources constitute more than half of total CO emissions in the nation



CO Emissions by Source Sector (Fig. 3-1, CO ISA)
From National Emissions Inventory & Biogenic Emissions Inventory System

CO NAAQS: Draft Policy Assessment

- 8-hour standard:
 - Evidence and quantitative dose estimates provide support for a standard at least as protective as current standard
 - Appropriate to consider range of policy options
 - Retaining the 8-hour averaging time
 - Retaining or revising the level of the standard within the range of 9 ppm (current level) to 3 ppm
 - If revising level, consider revising form to 99th percentile (or fourth highest) daily maximum, averaged across 3 years
- 1-hour standard:
 - Appropriate to consider range of policy options
 - Retaining the current standard to provide protection for effects from infrequent short duration peak ambient concentrations
 - Revising the standard, with consideration given to levels within the range from 15 ppm to 5 ppm, with a form of 99th percentile (or fourth highest) daily maximum
 - If revising 8-hour standard to lower level, consider revoking the 1-hour standard

2005 National Air Toxics Assessment (NATA) Update



- Why is NATA important?
 - Basis for comprehensive understanding of HAP impacts and risks nationwide
 - Best information we have on where air toxics problems exist; helps us identify data gaps
 - Data source for state and local agencies to target monitoring, community studies
 - Data source for EPA's use in residual risk, mobile and area source rules, monitor placement (e.g., schools, National Air Toxics Trends Stations), inputs for future EJ assessments, etc.
 - Foundation for moving to a broader air quality risk assessment including criteria pollutants: National Air Pollutant Assessment (NAPA)

2005 NATA: What's New?

- Inventory is greatly improved
 - Updates through regulatory data gathering efforts
 - Significant changes due to State and local agency review of preliminary NATA results
 - Over 60 S/L/Ts commented (versus 13 for 2002 NATA)
 - Data revisions for 19,000 facilities
- Atmospheric modeling greatly improved
 - Improved atmospheric transformation using CMAQ (acrolein, formaldehyde, and acetaldehyde)
 - Improved source modeling for various source types
- Updated risk characterization with latest science
 - Most significant change is formaldehyde (using IRIS cancer potency)
 - Estimated formaldehyde cancer risks will increase significantly; it will become national risk driver
 - Additional explanatory text will be provided on website

Current NATA Schedule

- Feb-May 2010 – Processed > 19,000 S/L/T comments, updated NATA analysis
- Late May 2010 – Begin 2-week preview for Regions/S/L/Ts
 - Develop draft communication and outreach materials
 - Host R/S/L/T webinar to discuss final results
- June 2010 – Brief management; share/review communication materials
 - Brief ADDs on final results and rollout plan
 - Brief NACAA on results and communications
- Late June 2010 – Planned public release of 2005 NATA

