



# Revisions to the National Ambient Air Quality Standards

## Recent Past, Present and Near Future

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# Outline

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- Clean Air Act (CAA) requirements
- Current standards and recent and planned revisions
- NAAQS Overviews
- Information Sources



# CAA Requirements for NAAQS

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- The Clean Air Act (CAA) contains EPA's authority to establish two types of national ambient air quality standards (NAAQS):
  - *Primary standards* to protect public health with an adequate margin of safety, including the health of at-risk populations such as children, people with asthma, and older adults.
  - *Secondary standards* to protect public welfare from any adverse effects, including effects on sensitive vegetation and ecosystems.
- The CAA also requires EPA to review the NAAQS at 5 year intervals and to make revisions as may be appropriate.
- The CAA generally requires EPA to designate nonattainment areas within 2 years after a NAAQS is established or revised
  - May be extended to 3 years if there is insufficient information to make the designations



# Current Air Quality Standards

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- EPA has established air quality standards for six pollutants:
  - Ozone
  - Particulate Matter – PM<sub>2.5</sub> and PM<sub>10</sub>
  - Nitrogen Dioxide (NO<sub>2</sub>)
  - Carbon Monoxide (CO)
  - Sulfur Dioxide (SO<sub>2</sub>)
  - Lead



# NAAQS Review Process

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- EPA currently prepares 5 types of documents it reviews a NAAQS:
  - Planning
  - Integrated Science Assessment
  - Risk/Exposure Assessment
  - Policy Assessment
  - Rulemaking
- Opportunities for public comment on each of these documents



# NAAQS Review Schedules

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- Chronological list of recently completed and upcoming NAAQS reviews:
  - Lead: Completed review in October 2008
  - Nitrogen dioxide: Completed review in January 2010
  - Sulfur dioxide: Completed review in June 2010
  - Ozone: Finalize reconsideration of the 2008 standard by August 31, 2010
    - Next 5-year review initiated—to be completed in February 2014
  - Carbon monoxide: Finalize review of the current standard by May 2011
  - PM2.5 and PM10: Finalize review of the current standards by October 2011
  - Sulfur dioxide/nitrogen dioxide combined secondary standard: Finalize review by March 2012



# Ozone

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- Health effects:
  - Reduce lung function; irritate, inflame and damage the airways; increase frequency of asthma attacks; increase susceptibility to respiratory infection; and aggravate chronic lung diseases such as asthma, emphysema and bronchitis.
- Welfare effects:
  - Interfere with the ability of sensitive plants to produce and store food; make sensitive plants more susceptible to certain diseases, insects, harsh weather, other pollutants, and competition; reduce or change plant species diversity in associated ecosystems; and visibly injure the leaves of plants.
- Man-made sources of ozone precursors—nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs):
  - Industrial facilities, electric utilities, motor vehicle exhaust, non-road equipment, gasoline vapors, and chemical solvents



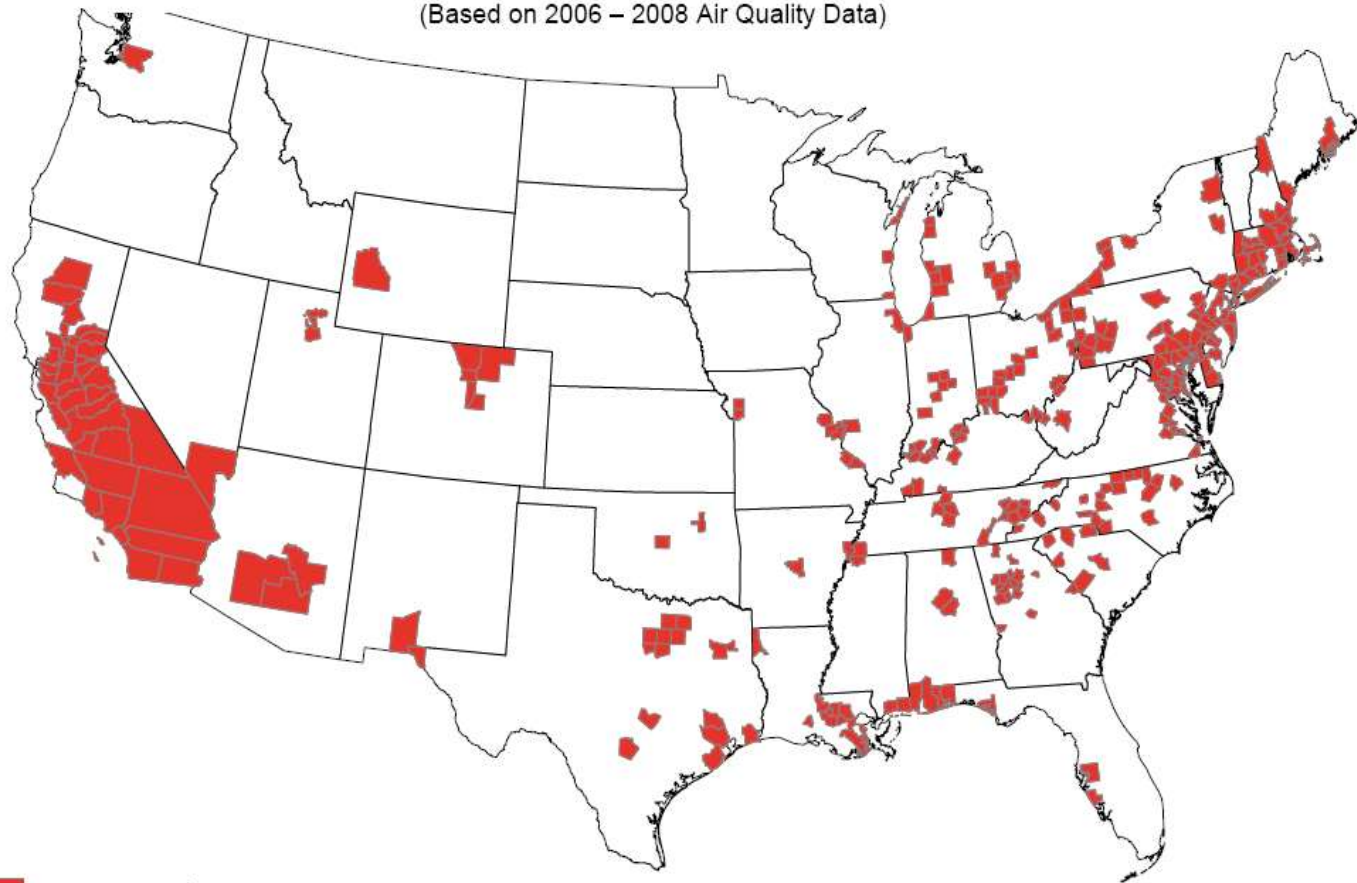
# Ozone: Implementation

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- In January 2010 EPA proposed:
  - A primary ozone standard in the range of 0.060 to 0.070 ppm
  - A secondary ozone standard in the range of 7 to 15 ppm-hours
  - A schedule for implementing the primary standard:
    - Designate areas in August 2011
      - Based on 2008 – 2010 air quality data
    - SIPs due in December 2013
    - This would result in the first conformity determination being required in August 2012
  - That the secondary standard could be implemented on the same schedule, or:
    - Designate areas in August 2012
      - Based on 2009 – 2011 air quality data
    - SIPs due in August 2015
    - This would result in the first conformity determination being required in August 2013

# Counties With Monitors Violating the March 2008 Ground-Level Ozone Standards 0.075 parts per million

(Based on 2006 – 2008 Air Quality Data)



322 of 675<sup>1</sup> monitored counties violate the standard

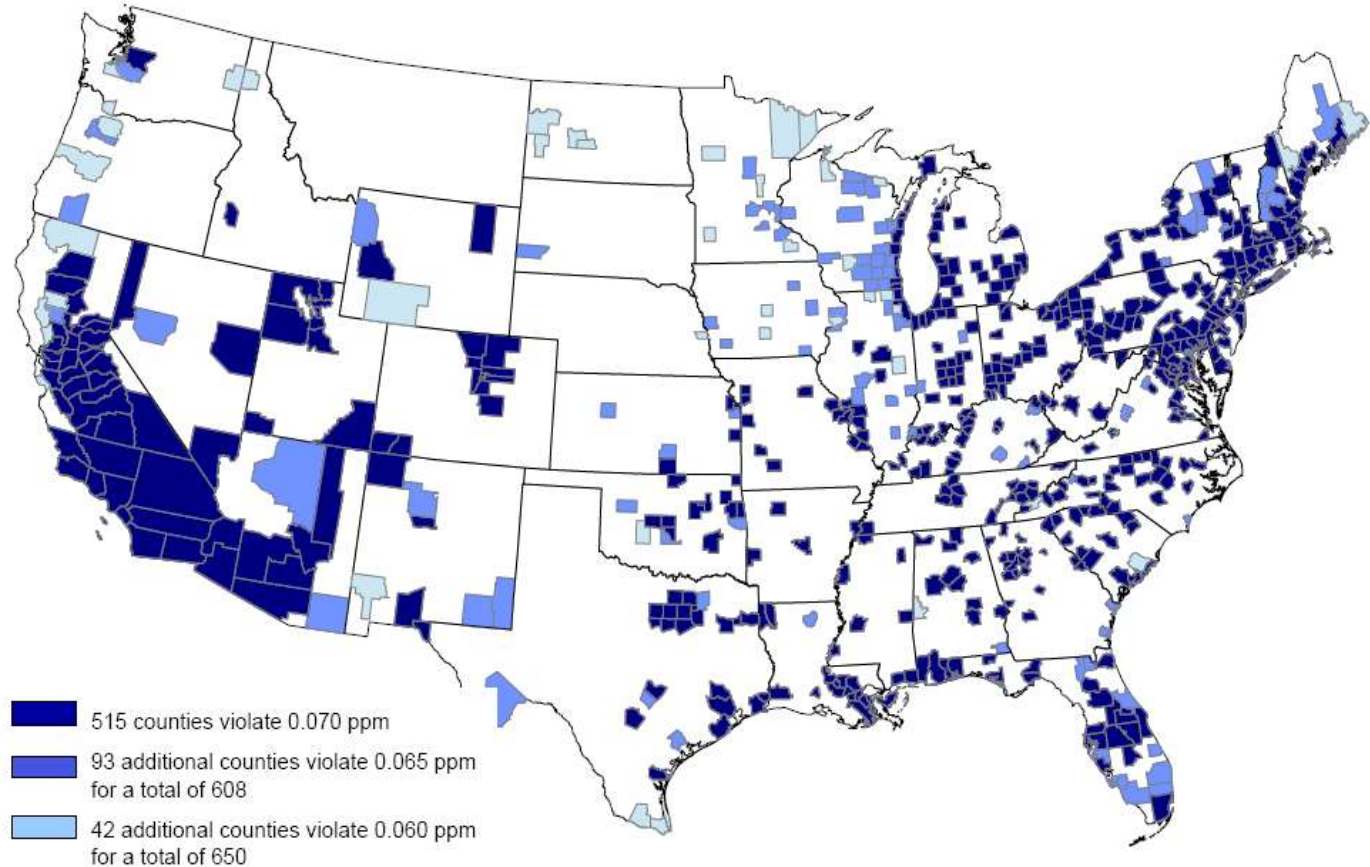
## Notes:

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 Primary 8-hour Ground-level Ozone Standards 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.



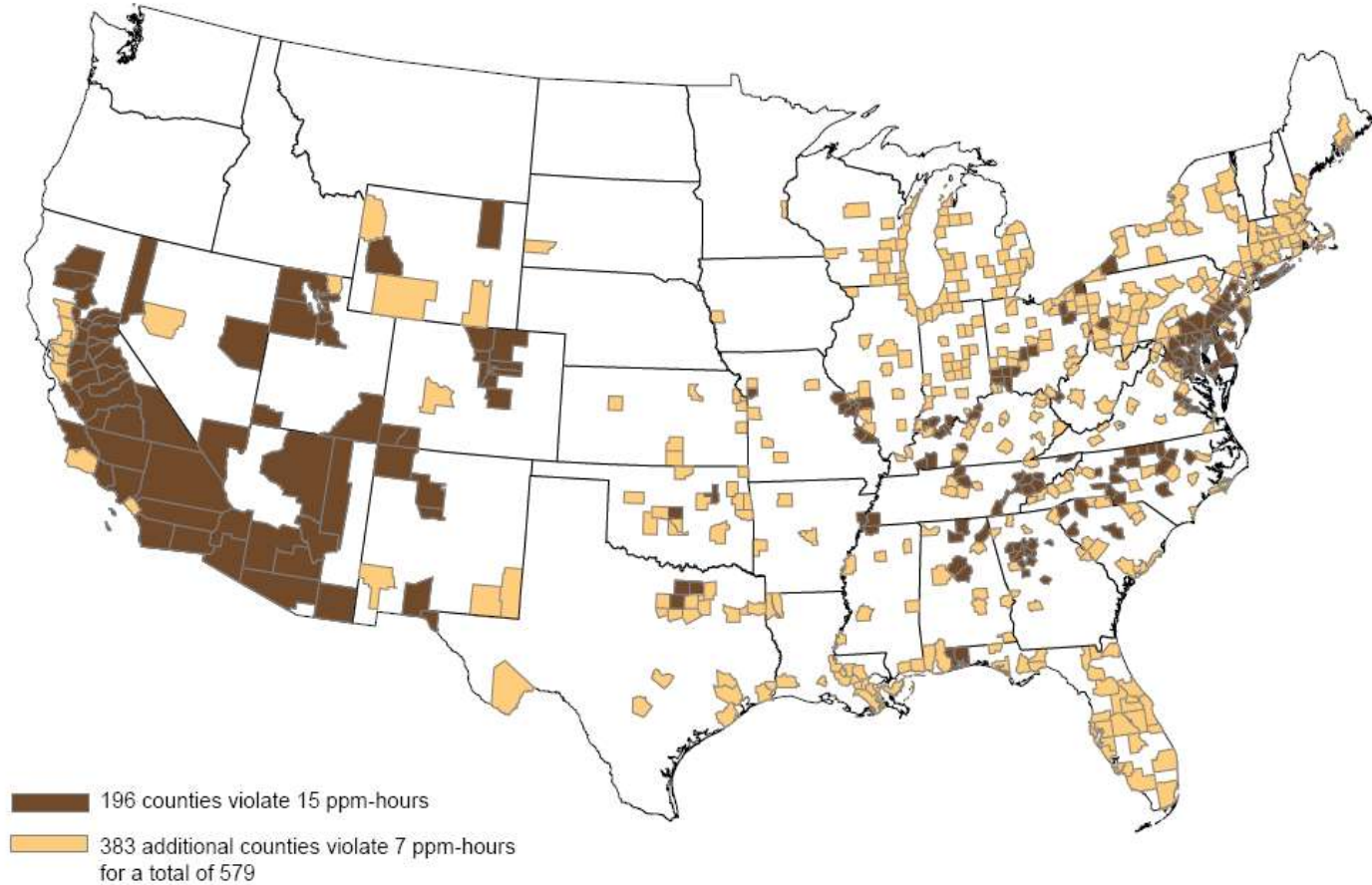
**Notes:**

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 Secondary Seasonal Ground-Level Ozone Standards 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.



# Ozone: Related Rulemakings

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- Proposed revisions to the air monitoring regulations:
  - At least 1 monitor required in urban areas with populations between 50 and 350K
  - At least 3 monitors in non-urban areas of each state:
    - Federal, state or tribal lands with sensitive vegetation of ecosystems to determine compliance with the secondary standard
    - Smaller population center (e.g., between 10 and 50K) expected to have concentrations near the primary standard
    - Maximum concentration outside of any urban area including the possibility of a site far downwind of an urban area.
  - Monitors to be in operation by January 2012.
  - Extend the length of the ozone monitoring season in many states
  - Could require as many as 270 new monitoring sites; however, this could be lower as some existing monitors could be relocated or some existing monitors operated by other agencies (e.g., the National park Service) could be used
  - Plan to finalize the monitoring revisions in August 2010
- Additional relevant rule proposals:
  - Rule to implement the 2010 ozone standards: propose August 2010
  - Transportation conformity rule revision: propose summer 2010



# PM2.5 and PM10

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- Health effects:
  - Decreased lung function; aggravated asthma; development of chronic bronchitis; irregular heartbeat; non-fatal heart attacks; and premature death in people with heart or lung disease
- Welfare effects:
  - Reduced visibility (haze); acidified lakes and streams; changed nutrient balance in coastal waters and large river basins; depleted nutrients in soil; damaged sensitive forests and farm crops; affected the diversity of ecosystems; and damaged stone and other materials
- Man-made sources of direct PM2.5 and PM10 and their precursors—NO<sub>x</sub>, VOCs, SO<sub>2</sub>, and ammonia (PM2.5 only):
  - Road dust; agriculture; construction; industrial processes; electric generating units; fires; motor vehicle exhaust; non-road equipment; gasoline vapors; chemical solvents; and fossil fuel combustion



# PM2.5 and PM10: Implementation

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- PM2.5:
  - Current PM2.5 standards:
    - Annual: 15.0  $\mu\text{g}/\text{m}^3$  established in 1997
    - 24-hour: 35  $\mu\text{g}/\text{m}^3$  established in 2006
  - Schedule for implementing the annual PM2.5 standard:
    - Designated areas in 2005
    - First conformity determination required in 2006
    - Implementation rule finalized in April 2007
    - SIPs due in 2008
    - Attainment dates range from 2009 to 2014
  - Schedule for implementing the 24-hour PM2.5 standard :
    - Designated areas in December 2009
    - First conformity determination required in December 2010
      - Issued final conformity rule for the 24-hour PM2.5 standard in March 2010
    - SIPs due in December 2012
    - Attainment dates range from 2014 to 2019
- PM10:
  - Current 24-hour PM10 standard: 150  $\mu\text{g}/\text{m}^3$  established in 1987
    - Annual standard revoked in 2006



# PM: NAAQS Review

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- EPA is currently reviewing the PM NAAQS
  - Rulemaking schedule:
    - Propose: February 2011
    - Finalize: October 2011
- In March the first external review draft of the policy assessment recommended revising the PM NAAQS as follows:
  - Consideration of a revised annual PM<sub>2.5</sub> standard within the range of 13 to 12  $\mu\text{g}/\text{m}^3$ , together with either retaining or revising the 24-hour PM<sub>2.5</sub> standard within the range of 35 to 30  $\mu\text{g}/\text{m}^3$ , or
  - Consideration of a revised annual PM<sub>2.5</sub> standard, within the range of 11 to 10  $\mu\text{g}/\text{m}^3$  together with revising the 24-hour PM<sub>2.5</sub> standard within a range of 30 to 25  $\mu\text{g}/\text{m}^3$ .
  - For PM<sub>10</sub> potential alternative standard levels will be presented in the second draft of the policy assessment
  - The policy assessment presents several alternative secondary PM standards to provide protection against PM-related visibility impairment during daylight hours
- Second external review draft of the policy assessment to be released later this year



# Nitrogen Dioxide: Primary NAAQS

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- Health effects:
  - Airway inflammation in healthy people; increased respiratory symptoms in people with asthma; increased visits to emergency departments and hospital admissions for respiratory issues, especially asthma.
  - Exposure to concentrations near roadways are of particular concern for susceptible individuals, including asthmatics, children, and the elderly
    - NO<sub>2</sub> concentrations near roadways are 30 – 100% higher than those measured at monitors in the existing area-wide network.
- Man-made sources of NO<sub>x</sub>:
  - On-road vehicles; non-road equipment; electric generating units; fossil fuel combustion; and industrial processes



# Nitrogen Dioxide: Implementation

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- In January 2010 EPA finalized a 1-hour primary NO<sub>2</sub> standard of 100 ppb
- Schedule for implementing the 1-hour NO<sub>2</sub> standard:
  - Designate areas in January 2012
    - Based on 2008 – 2010 air quality data
    - Almost all areas will be designated as “unclassifiable” because near road monitoring network does not yet exist (more on next slide)
  - If any nonattainment areas:
    - First conformity determination required in early 2013 (1 year after designation is effective)
    - SIP due in late-2013 (18 months after designation is effective)
    - Attainment date in early 2017 (5 years after designation is effective)
- EPA intends to redesignate areas in 2016 or 2017, as appropriate, based on the air quality data from the new monitoring network
- The annual average NO<sub>2</sub> air quality standard remains in effect
  - No area currently violates the annual standard

# Nitrogen Dioxide: Related Rulemakings

- Air monitoring regulations:
  - At least 1 monitor must be located near a major road in urban areas with populations over 500K
  - A second monitor is required near another major road in areas with:
    - A population greater than 2.5 million, or
    - One or more road segments with an AADT greater than 250K
    - Monitors must be placed near those road segments ranked with the highest traffic levels by AADT, considering fleet mix, congestion patterns, terrain, geographic location, and meteorology in identifying locations where the peak concentrations of NO<sub>2</sub> are expected to occur.
    - Monitors must be placed no more than 50 meters (about 164 feet) away from the edge of the nearest traffic lane.
    - EPA estimates that these requirements will result in a network of approximately 126 NO<sub>2</sub> monitoring sites near major roads in 102 urban areas.
  - A minimum of 1 monitor must be placed in any urban area with a population greater than or equal to 1 million people to assess community-wide concentrations.
    - An additional 53 monitoring sites will be required to assess community-wide levels these in urban areas.
    - Some NO<sub>2</sub> monitors already in operation may meet the community-wide monitor siting requirements.
  - Working with the states, EPA Regional Administrators will site at least 40 additional NO<sub>2</sub> monitors to help protect communities that are susceptible and vulnerable to NO<sub>2</sub>-related health effects.
  - All new NO<sub>2</sub> monitors must begin operating no later than January 1, 2013.
- Additional relevant rules:
  - Implementation addressed in the final rulemaking on the NAAQS in January 2010
  - No transportation conformity rulemaking planned at this time



# Carbon Monoxide

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- Health effects:
  - Cardiovascular Effects. At lower levels of CO is most serious for those who suffer from heart disease, like angina, clogged arteries, or congestive heart failure. For a person with heart disease, a single exposure to CO at low levels may cause chest pain and reduce that person's ability to exercise; repeated exposures may contribute to other cardiovascular effects.
  - Central Nervous System Effects. Even healthy people can be affected by high levels of CO. People who breathe high levels of CO can develop vision problems, reduced ability to work or learn, reduced manual dexterity, and difficulty performing complex tasks.
- Man-made sources of CO:
  - On-road vehicles; non-road equipment, fires; residential wood combustion; and industrial processes



# Carbon Monoxide: Implementation

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- Current NAAQS
  - 8-hour average = 9 ppm
  - 1-hour average = 35 ppm
- All but 1 nonattainment area has been redesignated to maintenance
  - Remaining area is Las Vegas which has submitted a maintenance plan and redesignation request



# Carbon Monoxide: NAAQS Review

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- EPA is currently reviewing the CO NAAQS
  - Rulemaking schedule:
    - Propose: October 2010
    - Finalize: May 2011
- First external review draft of the policy assessment recommended revising the CO NAAQS as follows:
  - 8-hour standard: between 3 and 9 ppm
  - 1-hour standard: between 5 and 15 ppm
- Second external review draft of the policy assessment to be released July 2010



# Sources of Information

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- EPA's NAAQS revision website at: <http://www.epa.gov/ttn/naaqs/> includes links to:
  - All documents associated with all on-going and recently completed NAAQS reviews
  - Information on implementation requirements for each NAAQS
  - Information on the process used in reviewing each of the NAAQS
- EPA Air Pollution Training Institute website at: <http://www.epa.gov/oar/oaqps/eog/> includes links to:
  - The 2010 Training Calendar
  - Webinar Schedules
  - On-demand video training material
  - Self-instructional courses

# Sources of Information-- continued



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- EPA's State Resources website at:  
<http://www.epa.gov/otaq/stateresources/index.htm> includes links to:
  - Guidance documents, models and calculators for quantifying emissions reductions from a wide range of mobile source measures
  - Regulations for on-road and non-road sources
  - Clean Diesel State and Local Tool Kit
  - Information on various funding sources
- EPA's MOVES website at:  
<http://www.epa.gov/otaq/models/moves/index.htm> includes links to:
  - The MOVES 2010 software to be downloaded
  - Instructions for downloading and installing the model
  - Technical and Policy Guidance on using the model
  - A users guide for the model

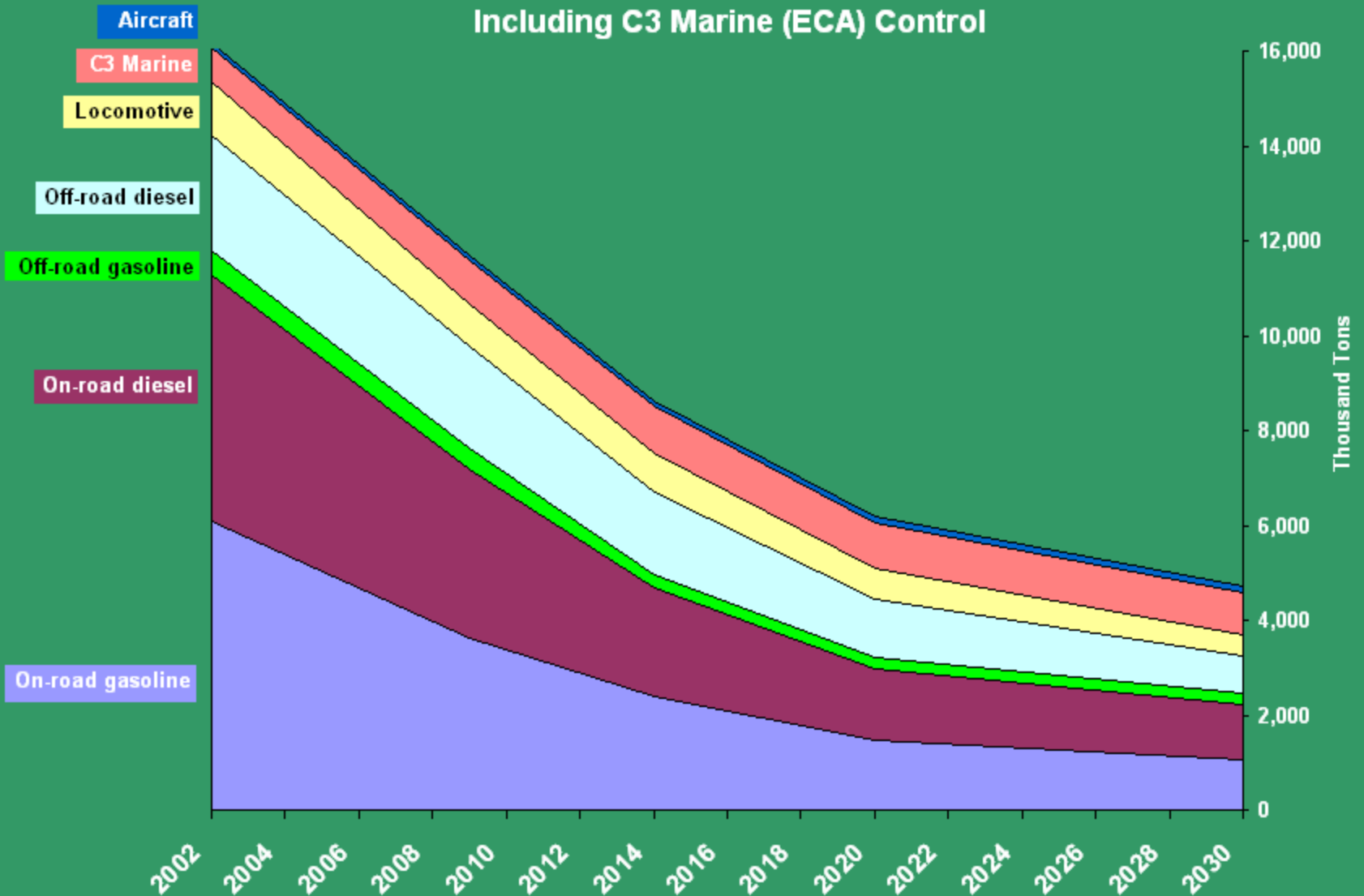


# Appendix

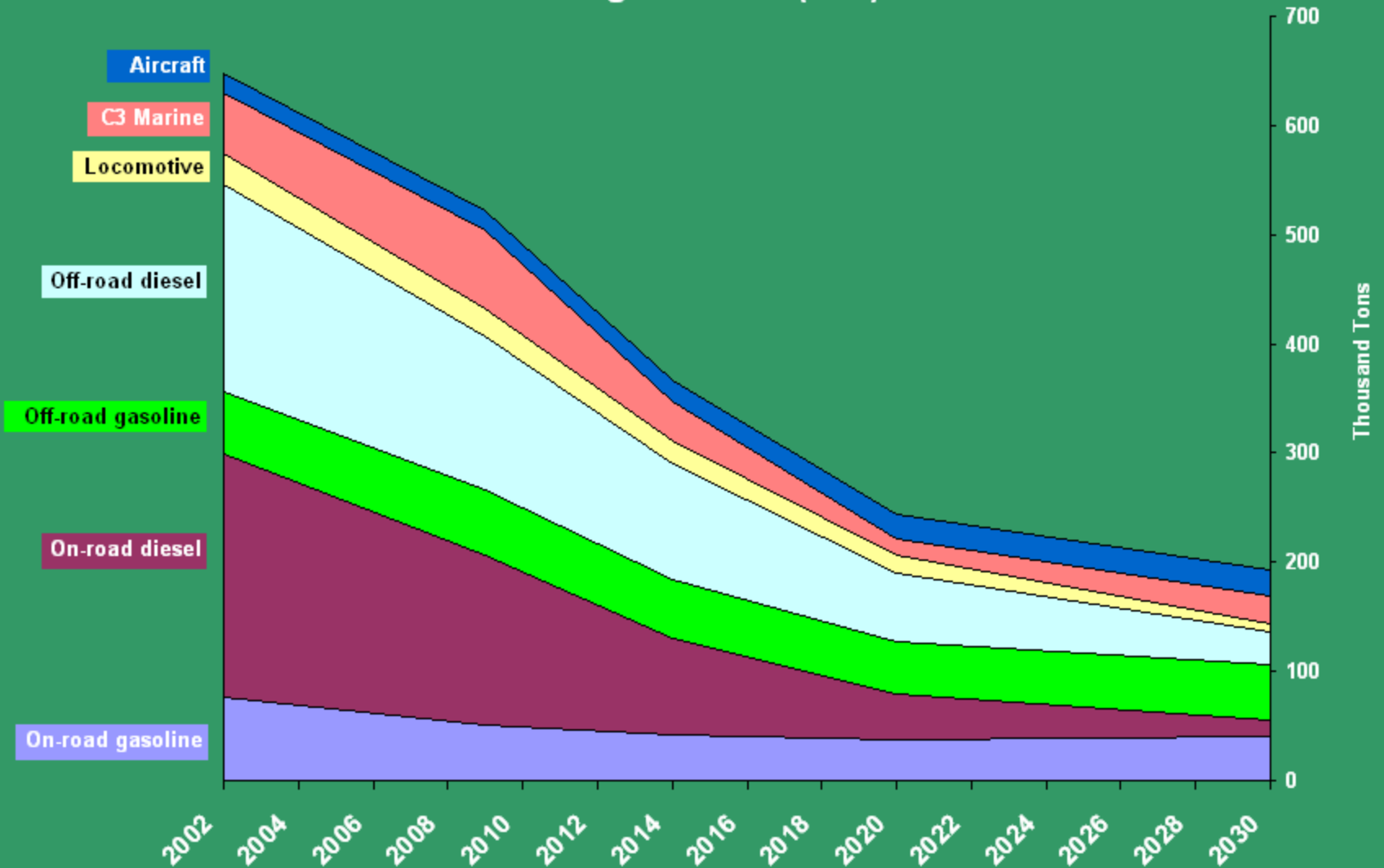
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## Mobile Source Emissions and Federal Mobile Source Rules

# Annual U.S. Mobile Source NOx Emission Projections Including C3 Marine (ECA) Control



# Annual U.S. Mobile Source PM2.5 Emission Projections Including C3 Marine (ECA) Control



# Mobile Source Clean Air Rules: *Comprehensively Addressing Air Pollutants*

## ■ Clean Cars and Passenger Trucks –Tier 2

- Stringent emissions standards for new gasoline and diesel light trucks and cars beginning in 2004
- 90 percent reduction in gasoline sulfur content, beginning in 2006
- National emissions reductions in 2030 of 3 million tons per year (tpy) of NO<sub>x</sub> and 800,000 tpy of VOCs



# Mobile Source Clean Air Rules: *Comprehensively Addressing Air Pollutants*

## ■ **Clean Heavy-Duty Trucks and Buses**

- Stringent emissions standards for new buses and trucks beginning in 2007
- 97 percent reduction in diesel sulfur content, phased in from 2006-2010
- Up to a 90% reduction in NO<sub>x</sub> and PM emissions



# Mobile Source Clean Air Rules: *Comprehensively Addressing Air Pollutants*

## ■ Clean Non-road Diesel Engines and Equipment

- Stringent emissions standards many types of non-road equipment
  - Standards phase-in between 2008 and 2015 depending on engine size
- 99 percent reduction in diesel sulfur content, by 2010
  - Marine and locomotive diesel sulfur control in 2012
- NOx and PM emissions reductions of more than 90 percent



# Mobile Source Clean Air Rules:

## *Comprehensively Addressing Air Pollutants*

### ■ **Mobile Source Air Toxics Rule**

- Fuel benzene standards beginning in 2011;
- Cold temperature hydrocarbon standards for vehicles phased in between 2010 and 2015; and
- Portable fuel container requirements beginning in 2009
- Significantly reduces hydrocarbon air toxics while delivering PM co-benefits
- National emissions reductions in 2030 of 1 million tpy of VOCs and 19,000 tpy of PM



# Mobile Source Clean Air Rules: *Comprehensively Addressing Air Pollutants*

## ■ **Locomotive and Marine Diesel Standards**

- Requires the same technologies as on-highway and non-road diesel engines
- Reduces PM by 90 percent and NOx by 80 percent for newly-built locomotives and marine diesel engines
- Tightens standards for existing locomotives and large marine diesel engines when they are remanufactured
- New engine standards phase-in beginning in 2009



# Mobile Source Clean Air Rules:

## *Comprehensively Addressing Air Pollutants*

### ■ **Small Gasoline and Recreational Marine Standards**

- New exhaust emission standards take effect in 2010-2012 depending on engine type/size
- First time ever evaporative emission standards for these sources
- Covers lawn and garden, utility vehicles, generator, a variety of other equipment, personal watercraft and outboard engines
- National emissions reductions in 2030 of 600,000 tpy of VOCs, 130,000 tpy of NO<sub>x</sub>, 5,500 tpy of PM, and 1.5 million tpy of CO.



# Mobile Source Clean Air Rules: *Comprehensively Addressing Air Pollutants*

## ■ Ocean-going Vessels

- By 2030 Ocean-going vessels (OGVs) will contribute about 40% of NOx and 48% of PM emissions from mobile sources
  - Over 40 major ports are located in PM and NOx nonattainment areas
- In March 2009, the US proposed that the International Maritime Organization (IMO) to designate US coastlines as Emission Control Areas (ECAs)
  - In March 2010, the IMO officially adopted the ECA designation
  - New engines
    - 20% reduction in NOx beginning in 2011
    - 80% NOx reduction beginning in 2016
  - Existing engines – 15-20% NOx reductions starting in 2010
  - Fuel Quality Standards
    - 30% fuel sulfur reduction by 2012
    - 97% fuel sulfur reduction by 2015
- EPA finalized regulations in December 2009 to implement these standards on US-flagged vessels





# Addressing the Legacy Fleet through the National Clean Diesel Campaign

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- There are about 11 million existing, high-polluting diesel engines not subject to our new standards.
- Focus on Key Sectors:
  - School buses, marine ports, construction, agriculture, freight
- Promoting retrofitting, early replacement, and idle reduction
  - In FY-08 national grants funded 14,000 retrofits which reduced NOx emissions by 46,000 tons and PM emissions by 2,200 tons.
- Program activities:
  - Technology verification
  - Technical and policy analysis
  - Coalitions and outreach
  - Innovative funding for projects
    - Federal grants, loans and tax incentives



# Clean Diesel Funding

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- Fiscal Year 2008 **\$49.2 M** Awarded
- 2009 Recovery Act **\$300 M** Awarded
  - 160 Grants
  - Preliminary projected results
    - 33,000 engines, vehicles, vessels
    - 5000 tons PM
    - 120,000 tons NOx
    - 850,000 tons CO2
    - \$1.2B - \$2.8B in health benefits (Pope, Laden)
- Fiscal Years 2009 & 2010 **\$120 M** Award in May-July
  - Almost 400 applications requesting about \$600 Million
  - Offering over \$1 Billion in matching funds



# Appendix

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## SO<sub>2</sub> and Lead NAAQS



# Sulfur Dioxide

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- Health effects:
  - Bronchoconstriction; increased asthma symptoms; and respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics
- Man-made sources of SO<sub>2</sub>:
  - Electric generating units; fossil fuel combustion; industrial processes; non-road equipment; and on-road vehicles



# Sulfur Dioxide: Implementation

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- In June 2010 EPA finalized a 1-hour primary SO<sub>2</sub> standard of 75 ppb
  - EPA is revoking the current 24-hour and annual SO<sub>2</sub> standards
    - Revocation to be effective one year after effective date of designations for the 2010 standards except in areas that are nonattainment for the current standard or have not fulfilled planning obligations for the current standard where the current standard will not be revoked until they submit and EPA approves a SIP for the 2010 SO<sub>2</sub> standard.
- Schedule for implementing the 1-hour SO<sub>2</sub> standard:
  - Designate areas in June 2012
    - Based on 2008 – 2010 air quality data; or refined dispersion modeling, if provided by the state
  - Nonattainment areas:
    - SIP due in early-2014 (18 months after designation is effective)
    - Attainment date in August 2017 (5 years after designation is effective)
- The current secondary SO<sub>2</sub> air quality standard remains in effect

# Sulfur Dioxide: Related Rulemakings



- Air monitoring regulations:
  - The final monitoring regulations require monitors to be placed in Core Based Statistical Areas (CBSAs) based on a population weighted emissions index for the area:
    - 3 monitors in CBSAs with index values of 1,000,000 or more;
    - 2 monitors in CBSAs with index values less than 1,000,000 but greater than 100,000; and
    - 1 monitor in CBSAs with index values greater than 5,000.
  - Approximately 163 SO<sub>2</sub> monitoring sites nationwide are required by this rulemaking.
  - All newly sited SO<sub>2</sub> monitors must be operational by January 1, 2013.
  - EPA plans to use a hybrid approach combining air quality modeling and monitoring to determine compliance with the new SO<sub>2</sub> health standard.
    - For a short-term 1-hour SO<sub>2</sub> standard, it is more technically appropriate, efficient, and effective to use modeling as the principal means of assessing compliance for medium to larger sources, and to rely more on monitoring for groups of smaller sources and sources not as conducive to modeling.
- Additional relevant rules:
  - Implementation addressed in the final rulemaking on the NAAQS in June 2010
  - Transportation conformity does not apply in SO<sub>2</sub> nonattainment and maintenance areas because on-road SO<sub>2</sub> emissions are minimal.



# Lead

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- Health effects:
  - Effects on developing nervous system, including the brain (e.g., IQ loss, poor academic achievement, permanent learning disabilities, increased risk of delinquent behavior), weakened immune system, and in adults increased blood pressure, cardiovascular disease, and decreased kidney function
- Man-made sources of lead:
  - Aviation gasoline usage; industrial processes (lead smelting, iron and steel foundries, copper smelting, metal mining, glass manufacturing, cement manufacturing); fossil fuel combustion; waste disposal; and electric generating units



# Lead: Implementation

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- In October 2008 EPA revised the lead NAAQS to 0.15  $\mu\text{g}/\text{m}^3$ 
  - The previous standard had been 1.5  $\mu\text{g}/\text{m}^3$
- Schedule for implementing the 2008 lead standard:
  - If data is available designate areas in October 2010
    - Based on 2007 – 2009 air quality data
  - If data not initially available, designate areas no later than January 2012
    - Based on 2008 – 2010 air quality data
  - Nonattainment areas:
    - SIPs due 18 months after designation is effective
    - Attainment date 5 years after designation is effective



# Lead: Related Rulemakings

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- Air monitoring regulations:
  - The October 2008 rule required monitoring in areas near sources with lead emissions greater than or equal to 1 ton per year (tpy). According to EPA's 2002 emissions estimates, 135 sources meet this criterion.
    - This source-oriented monitoring requirement may be waived by the EPA Regional Administrator if the monitoring agency can demonstrate that the lead source will not contribute to maximum lead concentrations greater than 0.075 ug/m<sup>3</sup> (50% of the NAAQS)
  - The operation of a lead monitor in every urban area with a population of 500,000 or more. The latest population estimates indicate there are 101 such areas.
  - EPA estimates that 236 new or relocated monitoring sites will be necessary to satisfy these monitoring requirements
    - Approximately half of the new monitors will be required to be operational by January 1, 2010
    - The rest of the new monitors will be required to be operational by January 1, 2011
  - In December 2009 EPA proposed to:
    - Require monitoring in areas near sources with lead emissions greater than or equal to 0.5 tpy.
      - An additional 160 monitors would need to be located near source emitting between 0.5 and 1 tpy
    - Treat airports serving aircraft that use leaded aviation gasoline identical to other point sources
    - Include lead monitoring in the planned NCORE monitoring network rather than requiring monitoring in urban areas with populations of 500,00 or more.
      - When fully operational in 2011 the NCORE network will consist of monitoring sites in 60 urban areas and 20 rural areas.

# Lead: Related Rulemakings-- continued



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- Additional relevant rules:
  - On April 28, 2010 EPA published an ANPRM on lead emissions from piston-engine aircraft that use leaded aviation gasoline
    - Describes and requests comment on data related to emissions, ambient concentrations, and exposure
    - Describes considerations regarding engine emission standards
    - Requests comment on approaches for transitioning the piston-engine fleet to unleaded gasoline
    - Comment period closes on June 28
  - Implementation addressed in the final rulemaking on the NAAQS in October 2008
  - Transportation conformity does not apply in lead nonattainment and maintenance areas because lead has been banned from gasoline used by on-road vehicles