

Reviews of the National Ambient Air Quality Standards for Particulate Matter and Ozone

Briefing for the Agricultural Air Quality Task Force

U.S. EPA Office of Air and Radiation
August 30, 2006

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PM NAAQS Review: Schedule

- *Proposal* signed on December 20, 2005
- *Public comment period*: January 17 - April 17, 2006
- *Public Hearings*: March 8, 2006 in Philadelphia, Chicago and San Francisco
- *Final Rule* to be signed September 27, 2006
 - PM NAAQS, Federal Reference Method, & Data Handling (Part 50)
- Related rulemakings:
 - *Air Monitoring Regulations: Requirements for Reference and Equivalent Methods, Network Design Requirements* (Parts 53 & 58)– also to be signed September 27, 2006
 - Advance Notice of Proposed Rulemaking on Transition Issues (published 2/9/06)
 - Proposed Rule on Exceptional & Natural Events (published 3/10/06)
- New RFA from National Center for Environmental Research STAR Grant Program: “Sources, Composition, and Health Effects of Coarse Particulate Matter,” open July 21, 2006-November 30, 2006

Overview of December 20, 2005 PM NAAQS Proposal

- Proposed revisions to the PM NAAQS address fine and coarse particles:
 - Fine particles ($PM_{2.5}$): *strengthen the daily standard*
 - Revise the 24-hour standard from current level of $65 \mu\text{g}/\text{m}^3$ to $35 \mu\text{g}/\text{m}^3$
 - Retain annual standard at $15 \mu\text{g}/\text{m}^3$
 - Set secondary standards equal to primary standards
 - Coarse particles: *replace PM_{10} standards with inhalable coarse particle standard ($PM_{10-2.5}$)*
 - Qualify $PM_{10-2.5}$ indicator to cover certain types of $PM_{10-2.5}$ particles of concern
 - Includes ambient mix of $PM_{10-2.5}$ dominated by resuspended dust from high-density traffic on paved roads and PM generated by industrial sources and construction sources, and excludes any ambient mix of $PM_{10-2.5}$ dominated by rural windblown dust and soils and PM generated by agricultural and mining sources
 - “Agricultural sources mining sources, and other similar sources of crustal material shall not be subject to control in meeting this standard.”
 - Set daily standard at $70 \mu\text{g}/\text{m}^3$
 - Do not set annual standard
 - Set secondary standard equal to the primary standard
- Requested comment on a range of alternatives
 - Fine particle standards
 - Annual: CASAC recommended range ($13\text{--}14 \mu\text{g}/\text{m}^3$); down to $12 \mu\text{g}/\text{m}^3$
 - 24-hour: CASAC recommended range ($30\text{--}35 \mu\text{g}/\text{m}^3$); down to $25 \mu\text{g}/\text{m}^3$ and up to $65 \mu\text{g}/\text{m}^3$
 - Sub-daily secondary standard to protect visibility: CASAC recommended range ($20\text{--}30 \mu\text{g}/\text{m}^3$); averaged over a 4-8 hr mid-day time period
 - Indicator for coarse particles
 - Other classes of sources that should be included or excluded
 - Unqualified indicator
 - Indicator based on PM_{10}

CASAC's Request for Reconsideration

- **Fine Particle Standards:**
 - Requested “reconsideration” of the level of the annual PM_{2.5} NAAQS to within the range previously recommended by the PM panel, i.e. 13 to 14 µg/m³
 - Risk assessment, which “followed CASAC’s advice” with regard to “sensitivity analyses” and “threshold assumptions,” was a “key component in the PM Panel’s recommendation”
 - Also recognized that reducing risks in different cities, with different air quality patterns, depended upon changes in both the 24-hour and annual standards
 - In summary, “epidemiologic evidence, supported by emerging mechanistic understanding, indicates adverse effects of PM_{2.5}” at levels below 15 µg/m³, and that “uncertainties would increase rapidly below the level of 13 µg/m³”
 - Requested that the sub-daily PM_{2.5} secondary standard to protect visibility, as previously recommended, “be favorably reconsidered”
- **Coarse Particle Standards:**
 - “The CASAC neither foresaw nor endorsed a standard that specifically exempts all agricultural and mining sources, and offers no protection against episodes of urban-industrial PM_{10-2.5} in areas of populations less than 100,000.”
 - Recommended focusing on “expansion of our knowledge of the toxicity of rural dusts rather than exempting specific industries (e.g. mining, agriculture).”
 - “Serious consideration should also be given to a secondary PM_{10-2.5} [standard] at a level similar to the proposed primary standard, but without the “urban” geographical constraint.”

Comments on Proposed Fine Particle (PM_{2.5}) Standards

- Support for more health protective primary standards (Environmental/public interest groups, many States, "100 scientists," AMA, ATS, APHA, various medical and public health associations, private citizens)
 - Science supports more health protective standards (e.g., 12/25 ug/m³)
 - EPA's proposed standards do not provide an adequate margin of safety for sensitive populations
 - EPA should have followed CASAC's recommendation to lower the level of the annual standard
- Support for retaining current primary standards (Industry)
 - Risks today are lower than in 1997
 - Science provides no basis for strengthening the current standards
 - Uncertainties are greater than in 1997 (e.g., model uncertainty, confounding, composition)
- No commenters argued to replace mass-based PM_{2.5} indicator with a composition-based indicator
- Many commenters cited new science as supporting their views to revise or retain the primary standards
- Some commenters support a separate, sub-daily secondary standard for visibility consistent with CASAC's recommendation (some States, some Environmental/public interest groups)

Comments on Proposed Coarse Particle Standards

- Commenters split on need for continued protection from PM_c:
 - CHPAC, States, Tribes, environmental and public health groups all strongly support continued protection
 - Industry groups, including commenters representing agriculture, mining, and transportation sectors, argue there is insufficient evidence to maintain any PM_c standard
- Significant disagreement among stakeholders regarding whether the PM_c indicator, if adopted, should be qualified to include/exclude certain types of particles
 - States, Tribes, environmental & public health groups, some industry (construction and transportation) strongly argue for unqualified indicator
 - Some industry commenters conditionally support qualified indicator (agriculture, mining)
- Specific qualifiers and exclusions controversial
 - As proposed, indicator fails to provide uniform national protection from particles of concern
 - Proposed exclusions for agricultural and mining sources opposed by States, Tribes, environmental and public health groups, and some industry, but supported by excluded sources
 - Proposed monitor siting criteria heavily criticized by States, Tribes, environmental and public health groups, and some industry; all recognize it will be difficult to implement
- Differing views on how to handle transition from PM₁₀ to PM_c: States, Tribes, and environmental and public health groups express concern about backsliding and support retaining PM₁₀ as interim standard; some industry groups support immediate revocation of PM₁₀ everywhere

PM NAAQS RIA: Overview

- Goal of analysis: Provide national estimates of costs and benefits of fully attaining current and proposed daily and annual PM_{2.5} NAAQS
- RIA for final rule significantly improved over proposal
 - More focus on known controls
 - Clear and defensible approach for cost effective control strategies
 - Nationwide attainment objective
- Analyzing 3 options for attainment in 2020:
 - Current standard: 15 µg/m³ annual/65 µg/m³ daily
 - 15 µg/m³ annual/35 µg/m³ daily
 - 14 µg/m³ annual/35 µg/m³ daily
- Developing nationwide cost and benefit estimates for full attainment of each option
 - Attainment analysis based on a combination of regional and local air quality modeling and GIS data analysis
 - Benefit analysis is based on regional air quality modeling using CMAQ

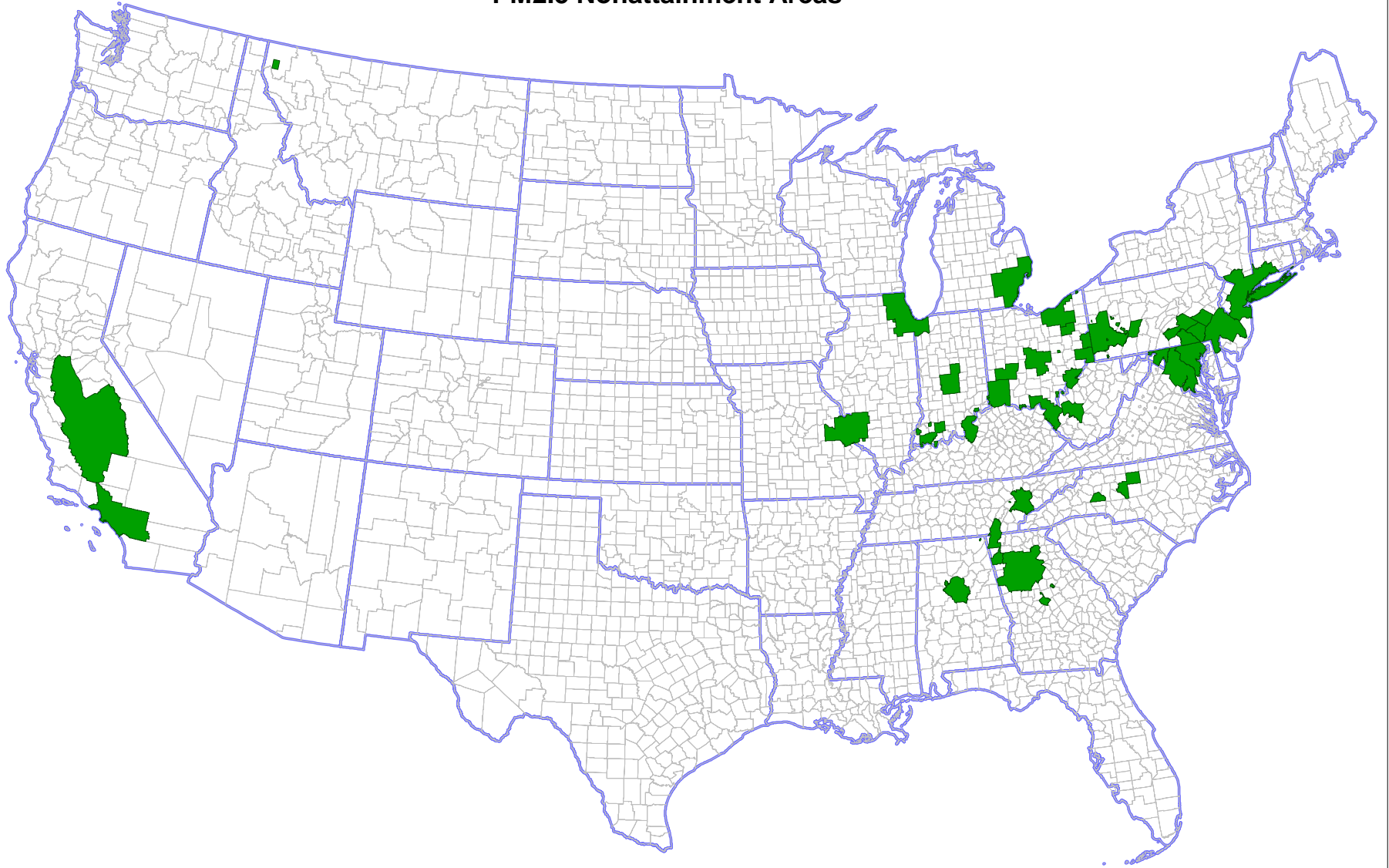
PM NAAQS RIA: Summary of Preliminary Results

- California presents a difficult challenge for strategies to attain both the current and proposed standards
 - Emission inventory and modeling limitations
 - Severity of air pollution problem
- For most of the U.S., cost and benefits of full attainment of proposed and alternative suites of standards are likely lower than 1997 estimates for attainment of the current standards
 - California's costs to meet the current standard will likely be high, as will the incremental costs of attaining tighter standards, but the bulk of California's challenges are in meeting the current standards.
- Benefits of full attainment will likely be at least equal to cost and are expected to be higher, with greater uncertainty about CA. Relative to the interim RIA, costs are substantially lower.
- Projections uncertainties affecting future baselines may result in higher or lower benefits and costs that we have estimated, however, benefits and costs will likely move in the same direction.

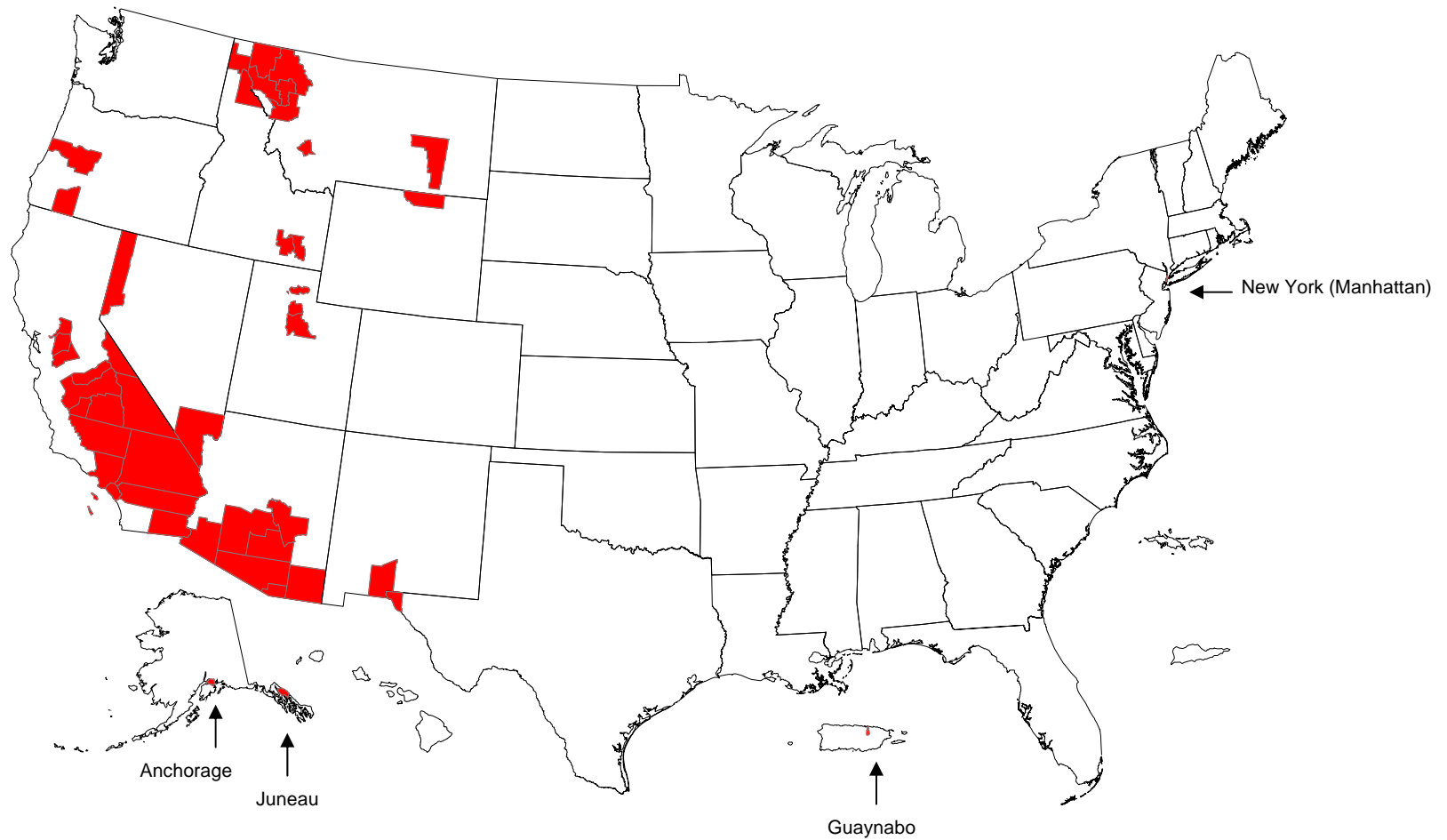
Preliminary Baseline Nonattainment Maps

- The following maps show the projected annual and daily design values and attainment status for U.S. counties with monitors, based on nationwide 36km² CMAQ modeling.
- These maps include:
 - 2020 Basecase attainment status for current (15/65), proposed (15/35), and more stringent (14/35) standards.
 - Increment of reduction from basecase required to attain current 15 microgram and more stringent 14 microgram annual standard
 - Increment of reduction from basecase required to attain proposed 35 microgram daily standard
- These maps are based on modeling conducted through August 1, 2006 and should be considered preliminary drafts.
 - A potentially significant methodological improvement to the underlying database of monitoring data from the speciation trends network (STN) may result in changes in the projected design values for the base and control case modeling results.
 - EPA expects this change to affect primarily locations in the Western U.S.. It may lead to lower baseline projected design values, as well as lower design values in the attainment scenarios.

**Currently Designated
PM2.5 Nonattainment Areas**



PM₁₀ Designated Nonattainment Counties (as of 7/25/2006)

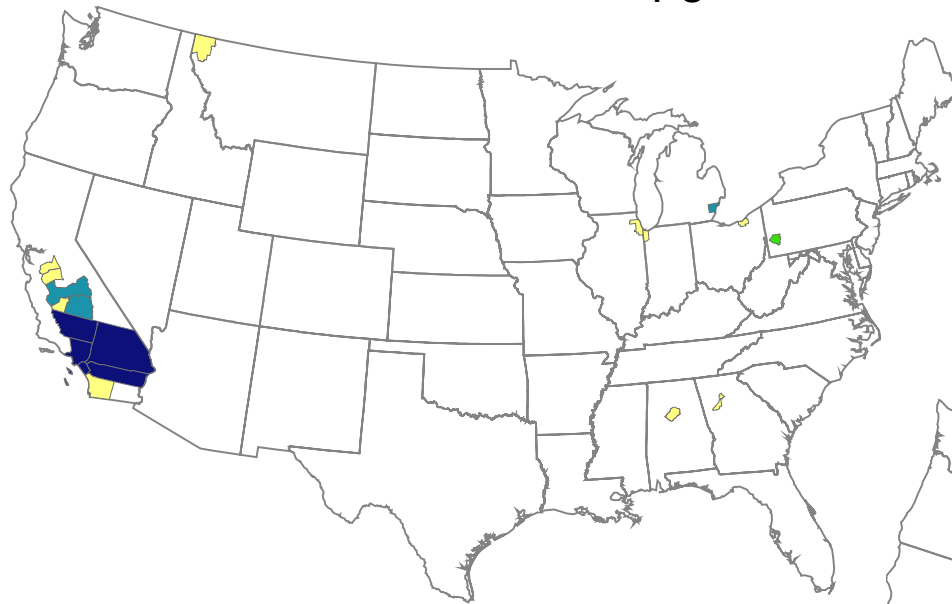


Note: Although entire counties are shaded, most nonattainment areas only encompass county portions. 47 counties shaded. [Actual: 5 whole counties (New York, Orange, Sacramento, Salt Lake, & Utah) and 43 partials]

Remaining Increments to Attain Current (15 $\mu\text{g}/\text{m}^3$) and More Stringent (14 $\mu\text{g}/\text{m}^3$) Annual $\text{PM}_{2.5}$ Standards in 2020

Incremental to baseline with CAIR/CAMR/CAVR and Mobile Source Rules without additional local controls for attainment of the current standards

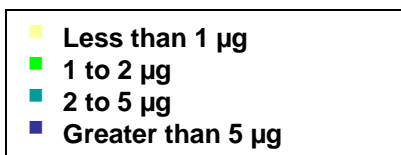
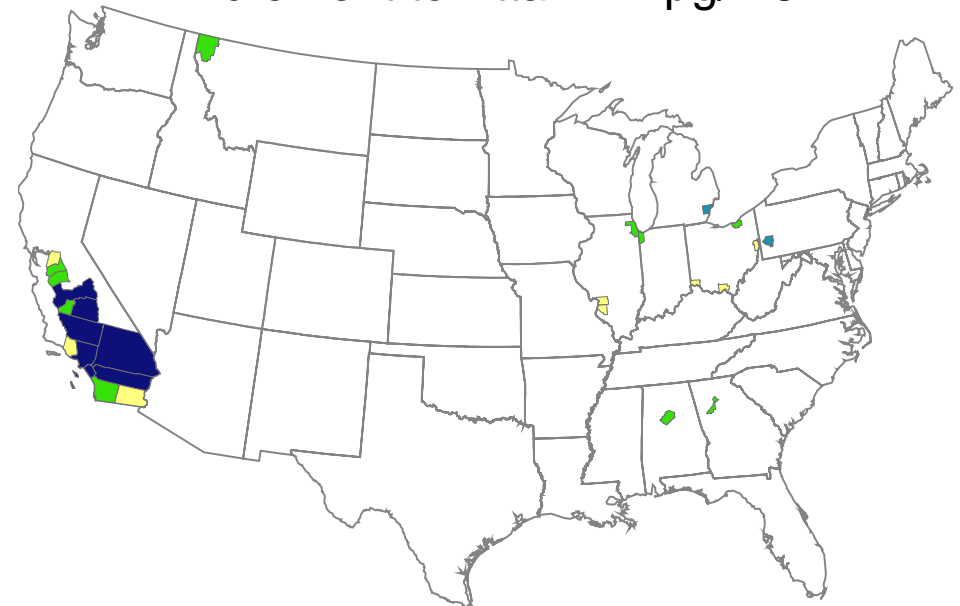
Increment to Attain 15 $\mu\text{g}/\text{m}^3$



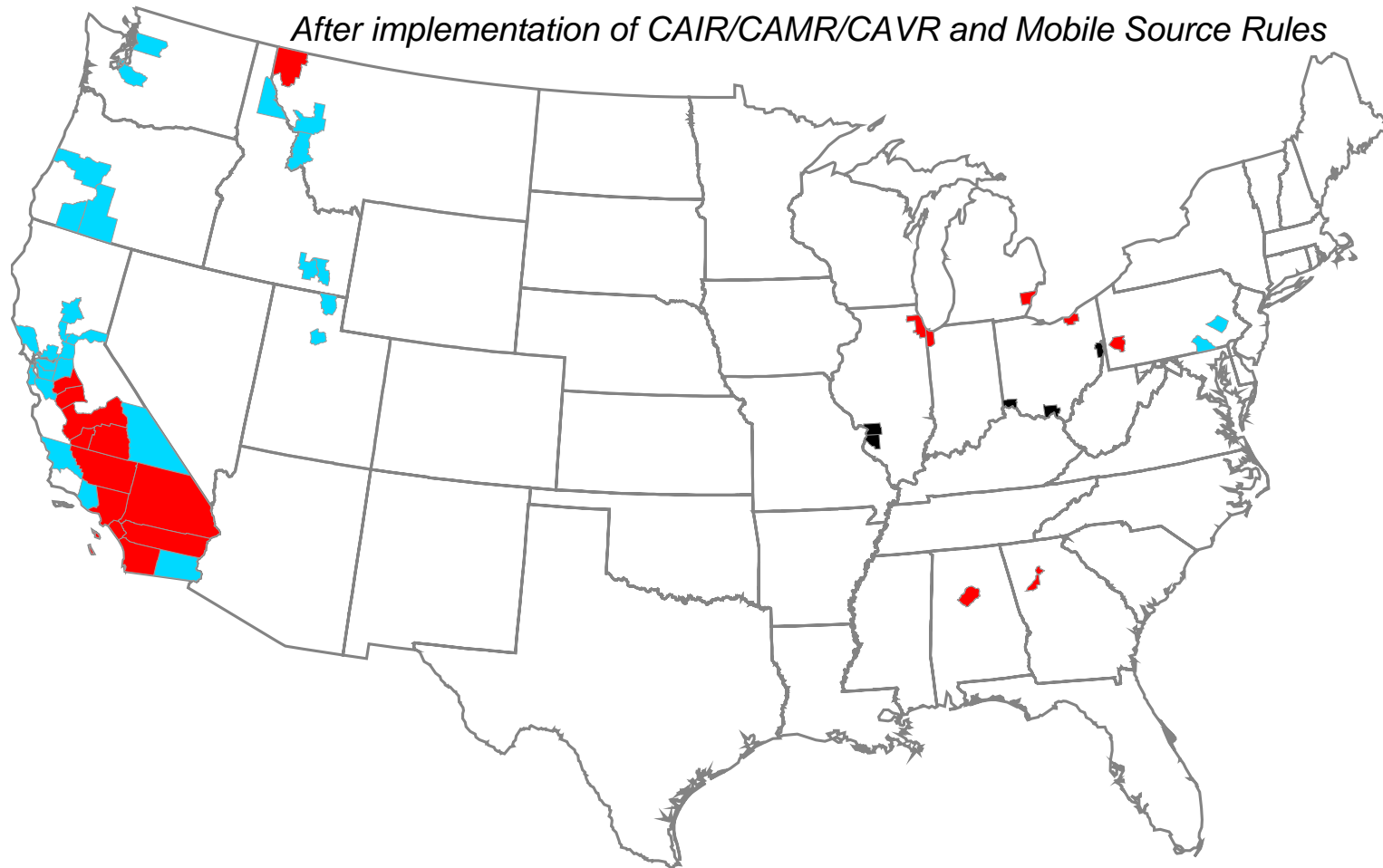
Preliminary Draft

**Based on preliminary modeling as of 8/01/06. Projected attainment status may change in future modeling scenarios. Design values may change significantly due to updates in the methodology for calculating species composition at monitors.*

Increment to Attain 14 $\mu\text{g}/\text{m}^3$



Monitored Counties Violating Current PM_{2.5} Standards (15/65), 15/35, and 14/35 µg/m³ Projected 2020*



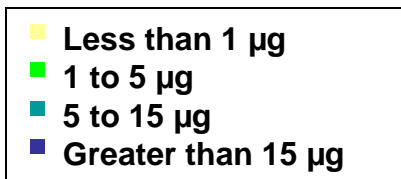
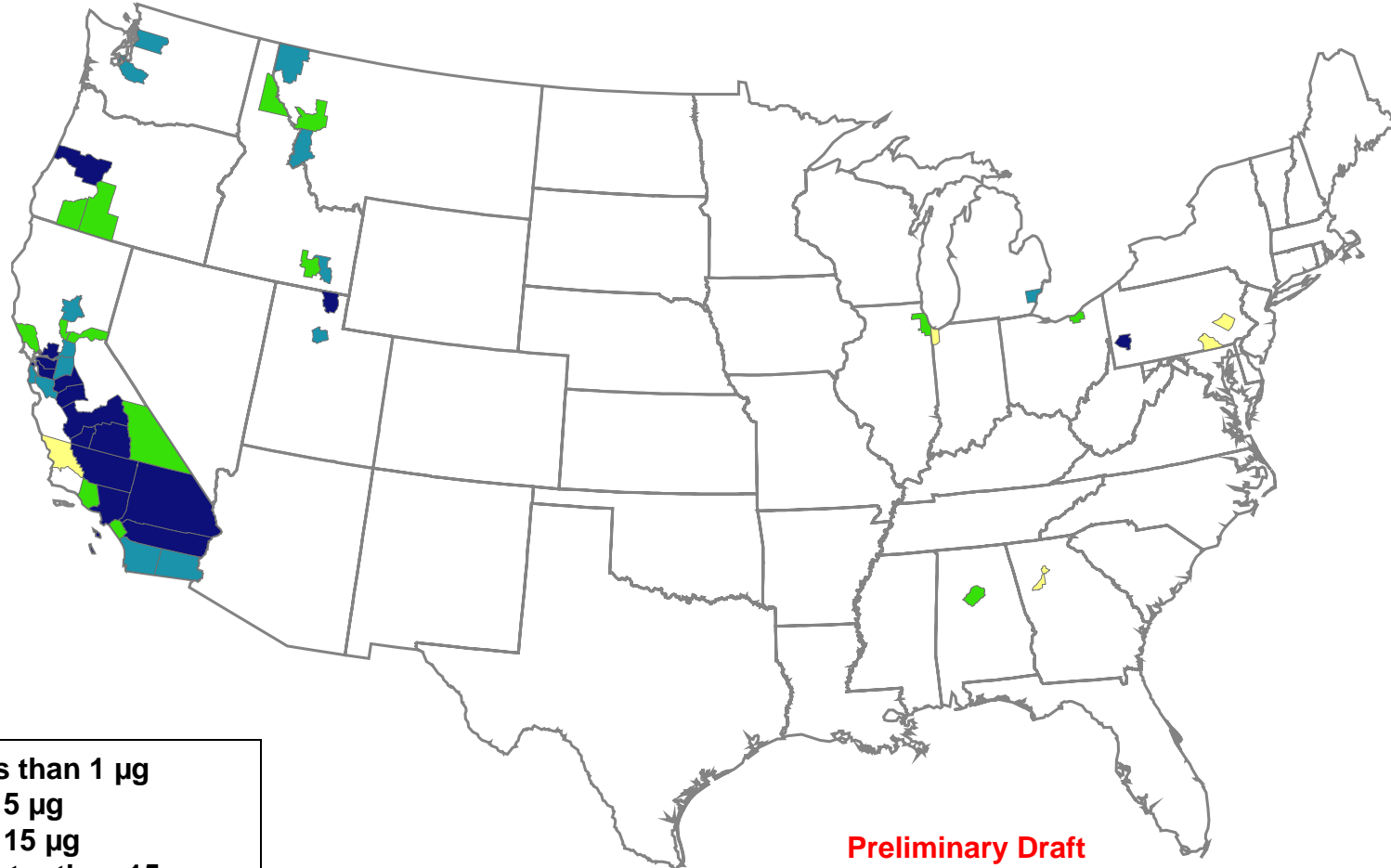
Preliminary Draft

- 19 counties violating current PM_{2.5} standards in 2020
- 30 additional counties violating 15/35 µg/m³ for a total of 49
- 25 additional counties violating 14/35 µg/m³ for a total of 55

*Based on preliminary modeling as of 8/01/06. Projected attainment status may change in future modeling scenarios. Design values may change significantly due to updates in the methodology for calculating species composition at monitors.

Remaining Increment to Attain Proposed 24-Hour PM_{2.5} Standard (35 µg/m³) in 2020

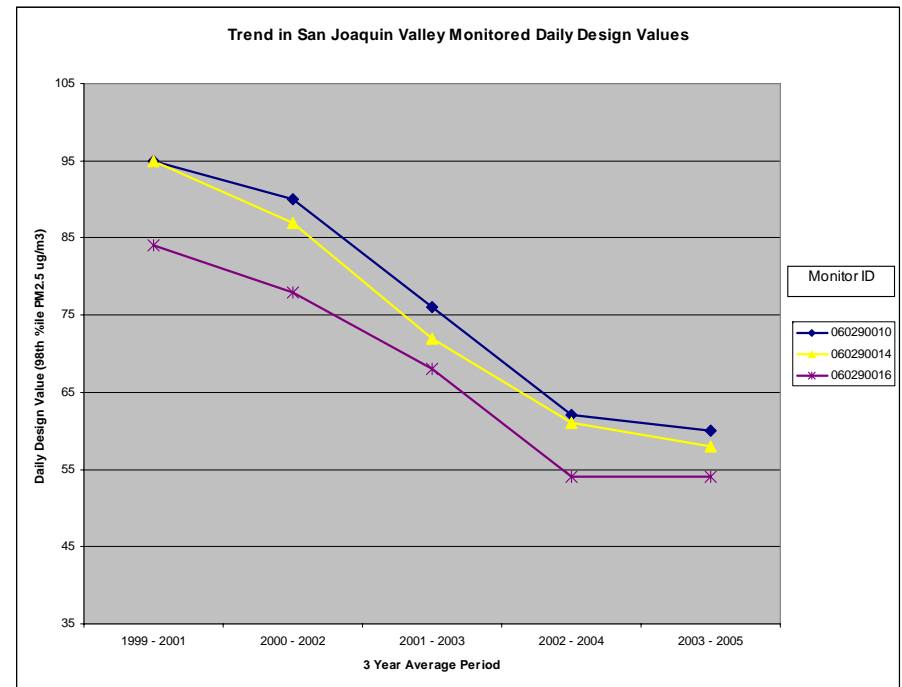
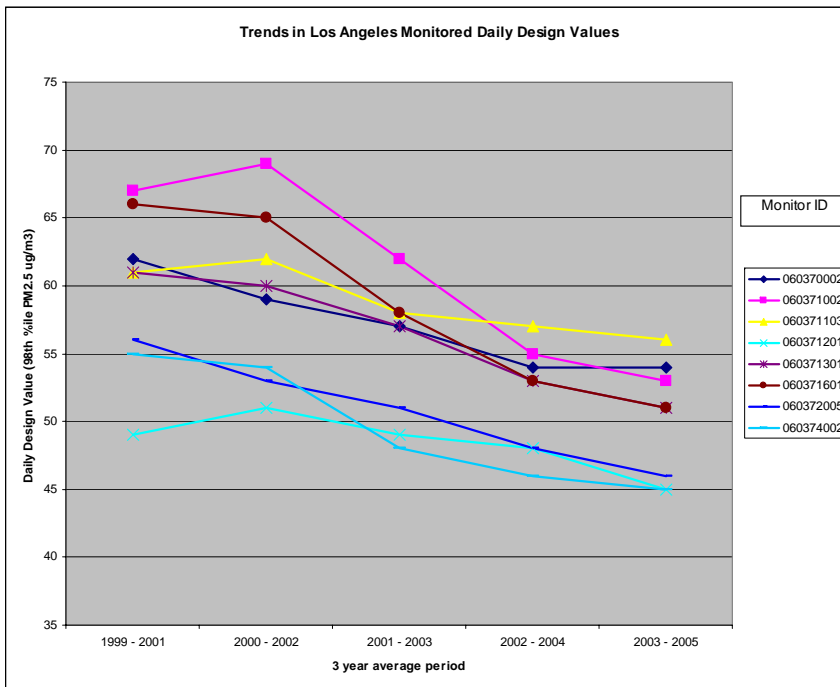
*Incremental to baseline with CAIR/CAMR/CAVR and Mobile Source Rules
without additional local controls for attainment of the current standards*



*Based on preliminary modeling as of 8/01/06.
Projected attainment status may change in future modeling scenarios. Design values may change significantly due to updates in the methodology for calculating species composition at monitors.

California

- Many counties in California remain out of attainment for the current and tighter standards even after application of all known and developmental controls.
- We are currently working to estimate what costs of full attainment might be.
- However, there are large uncertainties, both in the projections of emissions and future air quality, and in the types of controls that might be required to reduce PM_{2.5} to the levels of the standards.
- Recent air quality trends suggest that daily PM_{2.5} levels are in fact dropping in California, and thus our projections may be overstating the residual nonattainment problem in CA in future years.



Preliminary Analysis

Status of Ozone NAAQS Review

- Final Criteria Document released March 21, 2006
- Second draft Staff Paper and exposure, health risk, and environmental effects assessments released late July 2006
- CASAC meeting August 24-25, 2006
- Final Staff Paper targeted for release by the end of October 2006
- Consent decree schedule:
 - Proposed rule – March 2007
 - Final rule – December 2007

Major Issues in Ozone Review

- **Human health effects issues:**
 - Wide variety of health endpoints - greatest confidence in effects which are least severe
 - Controlled human exposure data extends down to 0.04 ppm for 6.6 hr
 - Strong epidemiologic evidence of respiratory symptoms in asthmatic children, ED visits, and hospital admissions at levels below current standard
 - Epidemiologic evidence highly suggestive of link to total (non-accidental) and cardiorespiratory mortality
 - CASAC has raised issues concerning the utility of time-series studies
 - Concerns about possible influence of exposure error
 - How well do studies account for correlations between co-pollutants?
 - Overall, epidemiologic findings of O₃-related health effects may be attributed to the direct effects of O₃ alone or as surrogate for photochemical oxidant mix

Major Issues in Ozone Review: Primary Standards

- **Options being analyzed**
 - Primary alternatives analyzed include: 0.08 ppm,, 4th max (current standard) and 0.07 ppm and 0.06 ppm, 4th max with current rounding convention (i.e., 0.084, 0.074, 0.064 ppm)
 - Also analyzed 0.08, 3rd max, 0.07, 3rd and 5th max
 - To address possible change in rounding convention also analyzed: 0.080 ppm and 0.70 ppm 4th max
- **Options for Administrator's consideration:**
 - If lung function decrements in healthy adults and children the only basis for the standard, then lower risk estimates than 1997 review might argue for consideration of less stringent standard
 - Staff identifies the current standard (0.08 ppm, 8-hr avg, 4th max) as an appropriate option for consideration, based on:
 - In addition to lung function decrements in healthy individuals, the large and expanded body of evidence from animal, human clinical, and epidemiology studies increases concerns for a variety of more serious effects in susceptible populations
 - These include: moderate pulmonary function responses (FEV₁ reduction \geq 10%) and respiratory symptom days in asthmatic children, respiratory hospital admissions, ED visits, and total (non-accidental) and cardiorespiratory mortality
 - Staff also identifies a lower level of 0.07 ppm, 8-hr avg, 4th max, as a reasonable option for consideration, based on:
 - Some highly responsive individuals experience lung function decrements at exposures as low as 0.06 and 0.04 ppm (6.6-hr average),
 - People with asthma are more susceptible to O₃ exposure - risk assessment has not fully addressed the range of health effects likely (e.g., increased medication usage, missed school and work days, physician visits)
 - Would place more weight on epidemiologic evidence of symptom days in asthmatic children, respiratory hospital admissions, ED visits, and non-accidental and cardiorespiratory premature mortality; some in urban areas with O₃ levels below the current standard

Major Issues in Ozone Review

- **Vegetation and Ecosystem Effects Issues**
 - Recent studies support and strengthen previous findings:
 - Ambient O₃ levels cause decreased yield and biomass in many crops and forest plants, respectively, and reduce the nutritive quality of some agronomic and forage crops
 - Leaf injury from O₃ exposure is widespread across U.S., as documented at US Forest Service bio-monitoring network field sites
 - O₃ effects on sensitive plant species, including loss of vigor and competitive advantage, have implications for ecosystems
 - A seasonal, cumulative, concentration-weighted index form (such as SUM06 or W126) is a more appropriate index for characterizing vegetation effects than an 8-hr. average form

Major Issues in Ozone Review: Secondary Standards

- Secondary NAAQS issues
 - 1996 proposal included an alternative secondary standard option: a 3-month, 12-hr SUM06 set at a level of 25 ppm-hr
 - Options analyzed:
 - Current standard of 8 hr. avg. of 0.084 ppm, 4th max
 - 8 hr., 0.070 ppm 4th max
 - 3 mo., 12 hr. SUM06 in the range of 15 to 25 ppm-hr
 - 3 mo., 12 hr. W126 in the range of 13 to 21 ppm-hr
 - Staff identifies a range of standards with biologically relevant forms as appropriate options for consideration, based on:
 - Continued scientific evidence that exposure duration and concentration are important in eliciting plant response
 - NAS Report/CAAAC recommendations
 - Need to develop appropriate indicators for Agency tracking/accountability
 - 1997 Consensus Report – 16 experts agreed on a cumulative, concentration-weighted form
 - Staff also identifies the current standard as an appropriate option for consideration