



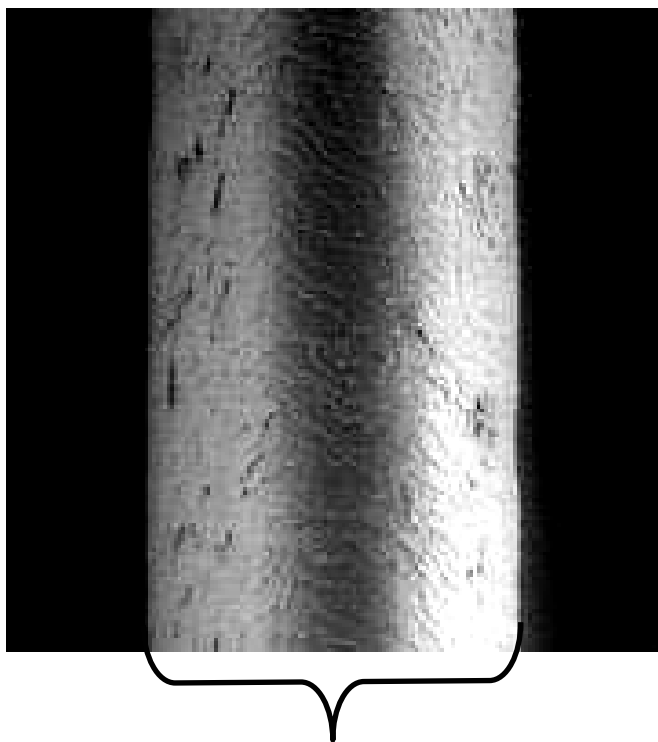
Fine Particles in the Air



Presentation for STAPPA Outreach Committee
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April 6, 2004

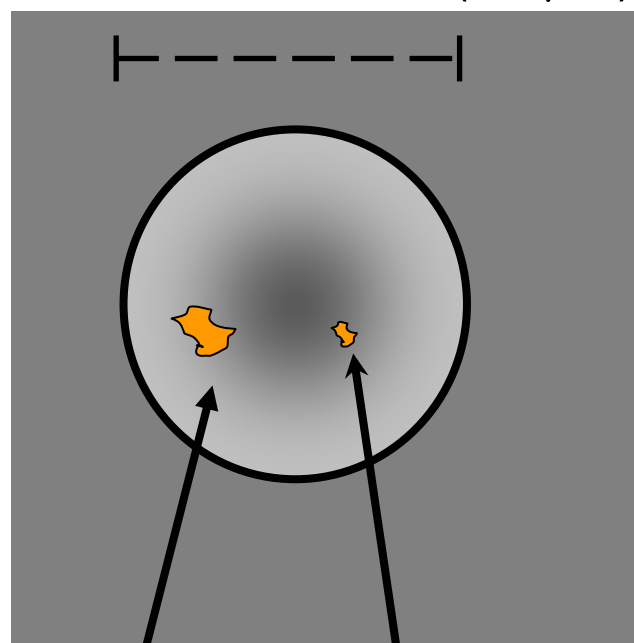
Particulate Matter: What is It?

A complex mixture of extremely small particles and liquid droplets



Human Hair (70 μm diameter)

Hair cross section (70 μm)



PM₁₀
(10 μm)

PM_{2.5}
(2.5 μm)

Wood-Burning Stoves



Power Plants



Heavy Duty Diesel Engines



Natural Sources



**Fine Particles Can Be
Emitted Directly or Formed
in the Air from Gases**

Cars and Trucks



Non-Road Vehicles



Forest Fires



Industrial Sources



Fine Particles: Why You Should Care



Public Health Risks Are Significant

Particles are linked to:

- **Premature death from heart and lung disease**
- **Aggravation of heart and lung diseases**
 - Hospital admissions
 - Doctor and ER visits
 - Medication use
 - School and work absences
- **And possibly to**
 - Lung cancer deaths
 - Infant mortality
 - Developmental problems, such as low birth weight, in children

Particles Affect the Lungs and Heart

- **Respiratory system effects**
 - Chronic bronchitis
 - Asthma attacks
 - Respiratory symptoms (cough, wheezing, etc.)
 - Decreased lung function
 - Airway inflammation
- **Cardiovascular system effects**
 - Heart attacks
 - Cardiac arrhythmias
 - Changes in heart rate and heart rate variability
 - Blood component changes

Some Groups Are More at Risk



- People with heart or lung disease
 - Conditions make them vulnerable
- Older adults
 - Greater prevalence of heart and lung disease
- Children
 - More likely to be active
 - Breathe more air per pound
 - Bodies still developing

Research is Continuing

- **Particle Components**

- Fine particles linked with serious health effects in many locations throughout the world, with different mixes of particle components
- No components can be ruled out

- **Specific types of sources**

- Diesel PM associated with lung cancer and other effects
- Combustion sources associated with mortality in some studies

PM NAAQS Review Timeline

- Review was delayed due to concern about statistical technique used in some recent studies on air pollution and health effects
- 2003 reanalyses by Health Effects Institute still showed statistically significant mortality risk from PM exposure

2004

- Completion of Criteria Document (state of the science)
- Issue 2nd revision of Staff Paper

2005

- Current schedule
 - Proposal: March 2005
 - Final: Dec. 2005
- Schedule is under negotiation with plaintiffs and likely to change

We Must Move Ahead

- Implementation of the fine particle standards is estimated to prevent:
 - Thousands of premature deaths from heart and lung disease every year
 - Tens of thousands of hospital admissions and emergency room visits
 - Millions of school and work absences due to aggravated asthma and other lung and heart diseases

Fine Particle Forecasting & Mapping



The Air Quality Index for Particles

Good (Green) 0-50	None
Moderate (Yellow) 51-100	Unusually sensitive people should consider reducing prolonged or heavy exertion.
Unhealthy for Sensitive Groups (Orange) 101-150	People with heart or lung disease, older adults and children should reduce prolonged or heavy exertion.
Unhealthy (Red) 151-200	People with heart or lung disease, older adults and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.
Very Unhealthy (Purple) 201-300	People with heart or lung disease, older adults and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.

Fine Particles Reduce Visibility



- Example: Chicago in the summer of 2000.
 - Left – a clear day: $PM\ 2.5 < 5\ \mu g/m^3$
 - Right – a hazy day: $PM\ 2.5 \sim 35\ \mu g/m^3$

Particles May Be Transported Long Distances And Impact Large Numbers Of People

Wind Direction



Fine Particle Level



Small City w/
Power Plant

Town

Large City

Facility

Large City

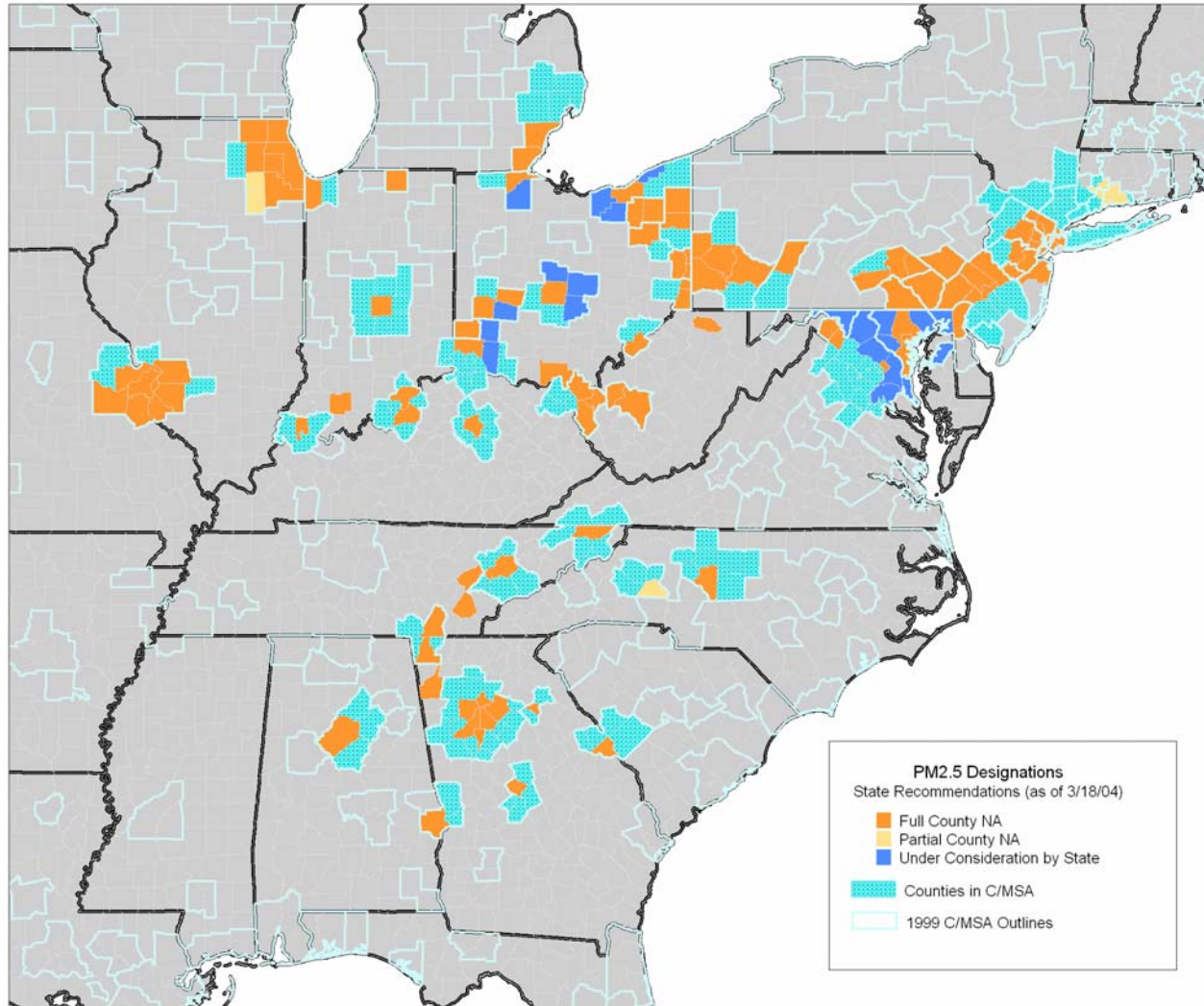
Town

— 200-300 miles —

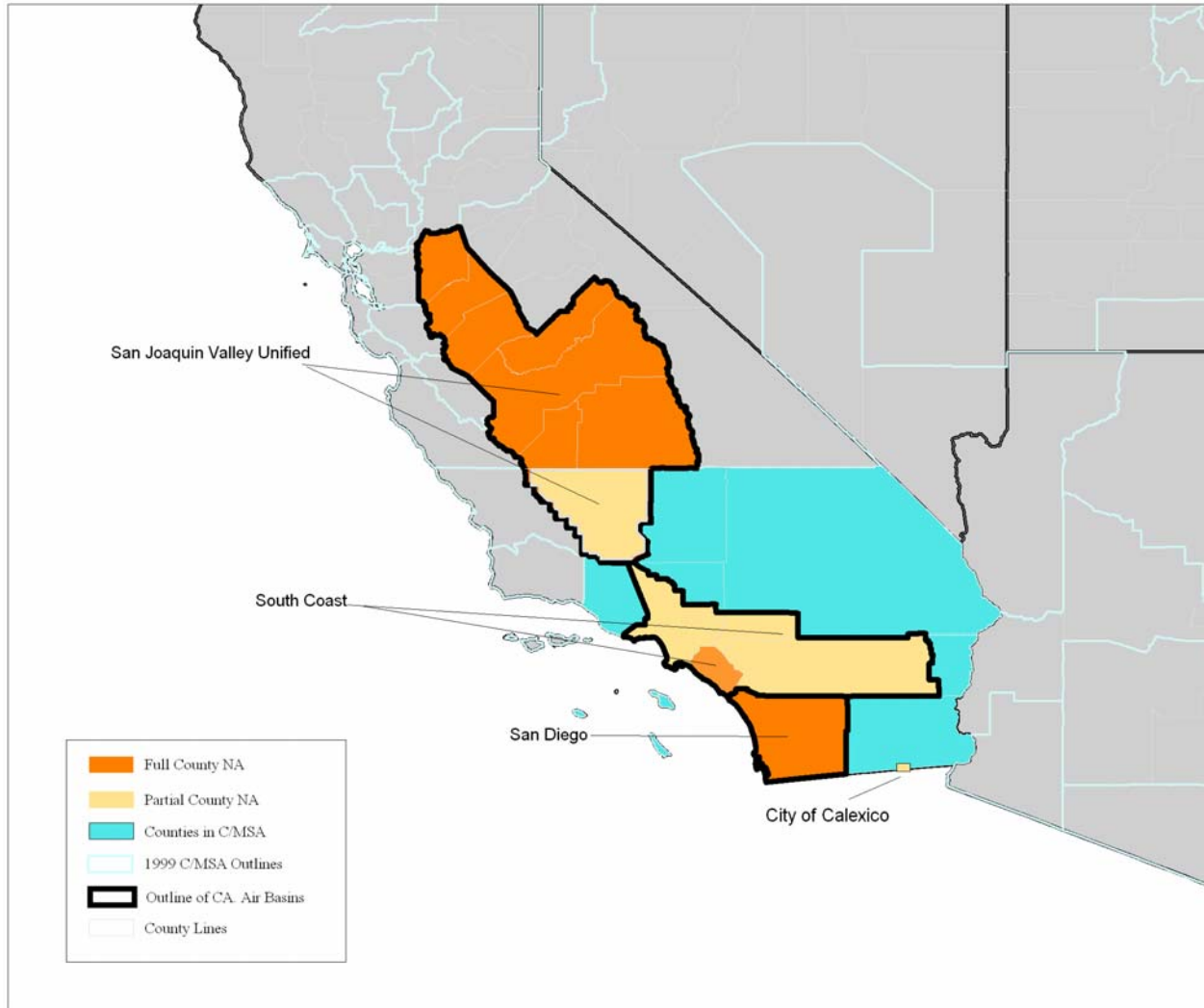
Many Areas Are at Risk

- Fine particles
 - can be transported long distances
 - are a regional problem
 - are a year-round problem
 - can affect health, even in attainment areas
- Nonattainment: primarily California and the East

Fine Particles: A Significant Nonattainment Problem in California and the East



Fine Particles: A Significant Nonattainment Problem in California and the East



Note: in the West, one other violating monitor is located in Libby, MT.

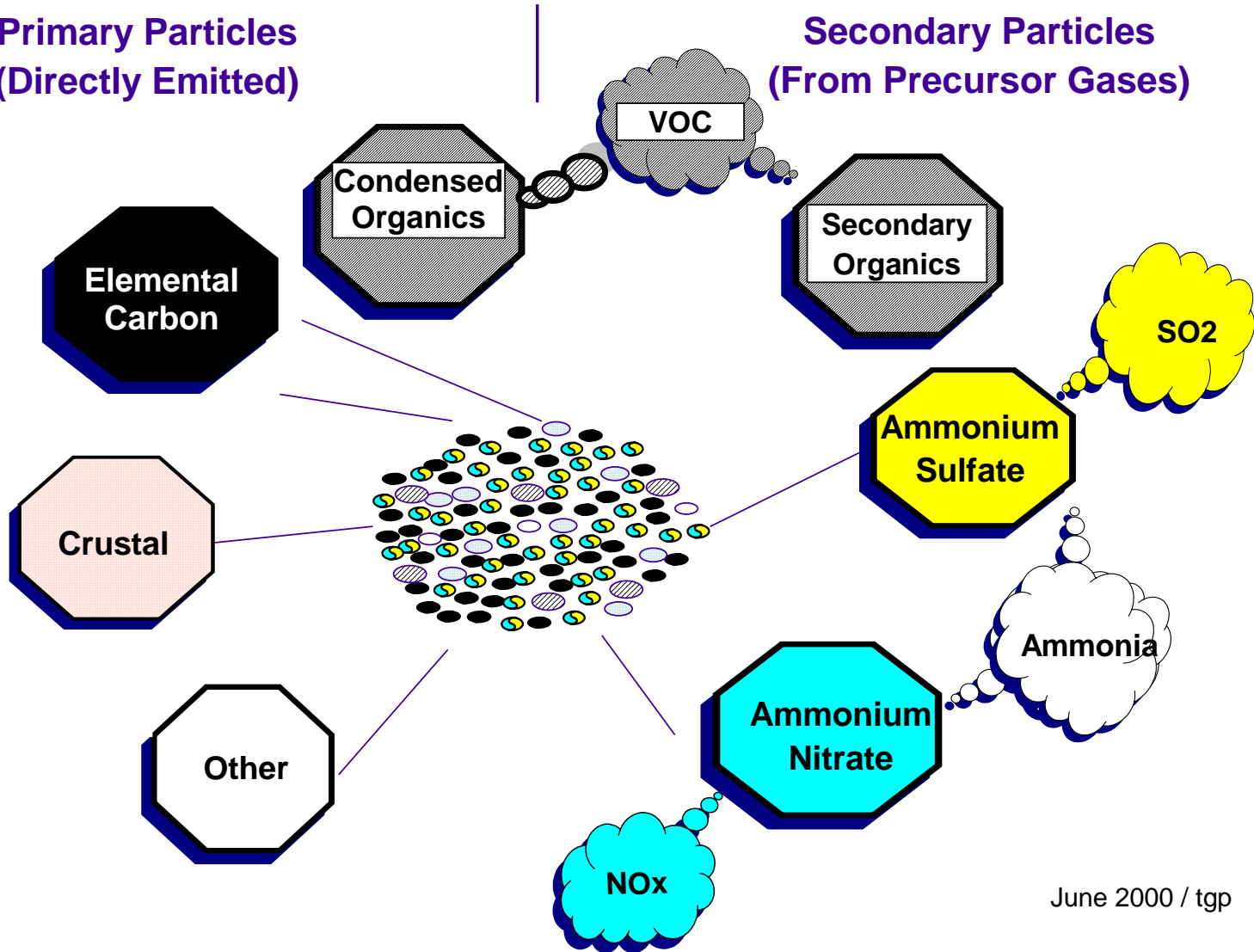
PM2.5 Nonattainment Designations

- Summary of State Recommendations
 - 116 nonattainment (NA) counties
 - 8 partial NA counties
 - 21 counties in OH and MD recommended as NA in “options” under consideration
 - Total population of these 145 counties = 82 million
- Presumptive metro areas associated with these counties
 - 310 counties in 45 areas with 105 million population
- Website – www.epa.gov/pmdesignations
 - State recommendation letters, technical info, and EPA responses when sent out this summer

PM 2.5 In Ambient Air: A Complex Mixture

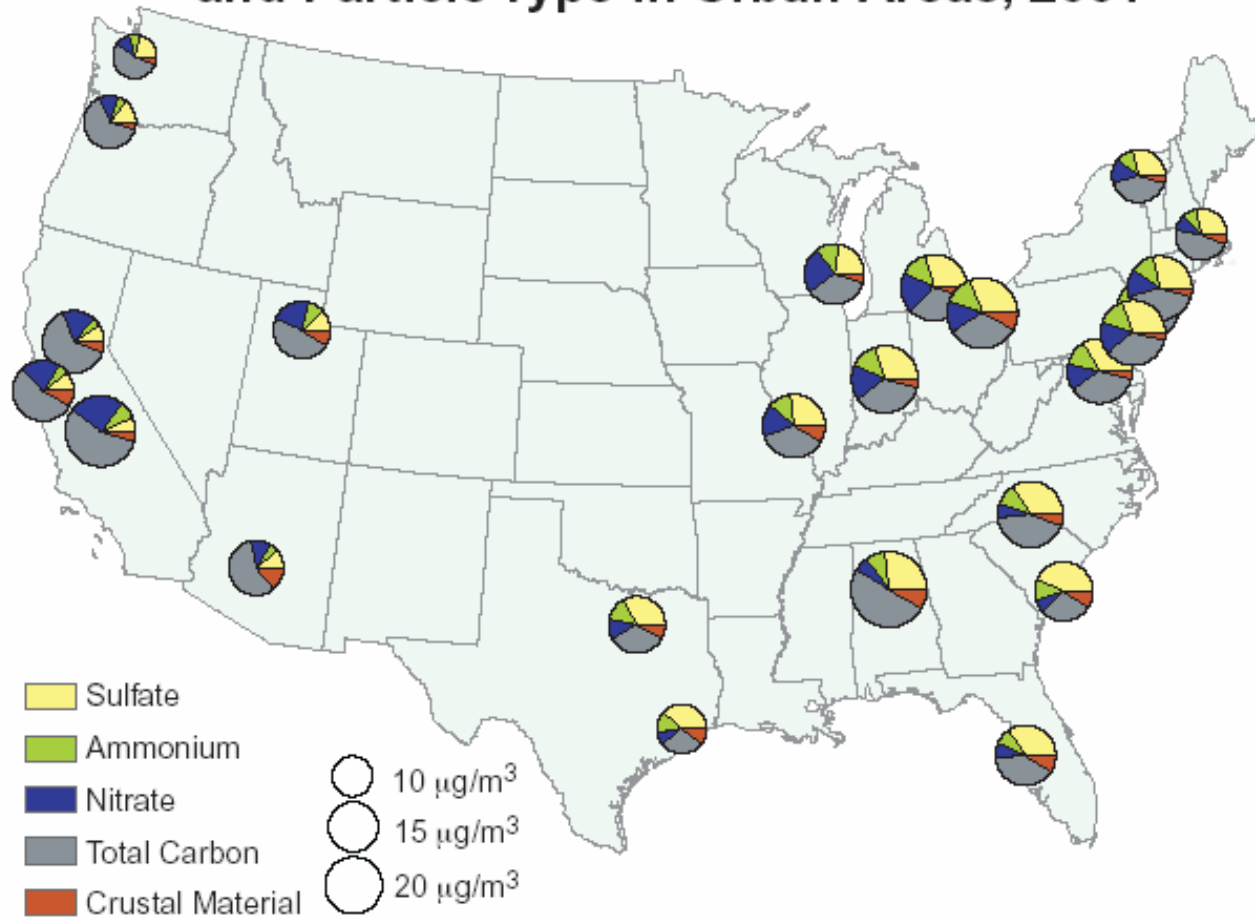
Primary Particles
(Directly Emitted)

Secondary Particles
(From Precursor Gases)



Particle Composition Varies

Annual Average PM_{2.5} Concentrations ($\mu\text{g}/\text{m}^3$) and Particle Type in Urban Areas, 2001



EPA's Role: Protecting and Improving Air Quality

- EPA set national air quality standards for fine particles in 1997
- New standards withstood all legal challenges, including U.S. Supreme Court
- Moving forward to implement standards

Reducing Fine Particles

- Approach must include national, regional and local strategies
- National efforts under way:
 - Existing programs such as Acid Rain program, NOx SIP call, and heavy duty diesel rule & limits for sulfur in fuel
 - Rules not yet in effect, such as Interstate Air Quality Rule and rule to control emissions from non-road vehicles & equipment

Interstate Air Quality Rule

- Addresses contribution of transported SO₂ and NO_x to PM_{2.5} and ozone nonattainment problems
- Geographic scope: for SO₂, 28 eastern states + DC
- Proposes a **two-phase program** with declining emission caps
 - SO₂: 3.9 million tons in 2010 and 2.7 million in 2015
 - NO_x: 1.6 million tons in 2010 and 1.3 million in 2015
- Cap and trade program with State flexibility
- Significant annual public health benefits: \$82.4 billion in 2015
 - Reasonable annual costs: \$3.7 billion in 2015
- Schedule
 - Proposal: Dec. 2003
 - Supplemental proposal: April/May 2004
 - Final: Dec. 2004

Example Local Reduction Programs

- Diesel retrofits (trucks, school buses, stationary engines)
- Diesel idling (trucks, trains, port equipment, etc.)
- Programs to reduce emissions from poorly maintained vehicles
- New or improved direct PM and precursor controls on stationary sources
- Year-round operation of seasonal stationary source NO_x controls
- Increase use of alternative fuel, hybrid vehicles
- Buy-back programs for small engines (boats, vehicles, equipment)
- Year-round measures to reduce VMT (Commuter Choice, carpooling incentives, etc.)
- Open burning laws and better enforcement
- Programs to reduced emissions from residential wood combustion and back yard barrel burning
- Smoke management plans
- Improved monitoring techniques and more frequent monitoring on sources with control devices
- Reducing emissions of volatile aromatic compounds (surface coatings, gasoline, solvents, etc.)
- PM Action Days ??

** We have provided grant funding to STAPPA to develop a PM_{2.5} “Menu of Options” document. Target date for completion is late 2004.

PM_{2.5} Implementation Timeline

Date	Action
Feb. 2004*	State designation recommendations due to EPA
April 2004	Implementation rule to OMB
July 2004	EPA proposes implementation rule
July-Aug 2004	EPA letters to States responding to PM _{2.5} designation recommendations
Dec. 2004*	EPA finalizes designations
Late 2004- Early 2005	EPA finalizes implementation rule

* Dates codified in Consolidated Appropriations Bill of FY2004. SIP due dates for PM_{2.5} and regional haze are 3 years from effective date of PM_{2.5} designations.

Nonattainment Area Boundaries

- Presumption: Metropolitan areas & counties
- Factors to consider:
 - Location and magnitude of emissions within or near the area
 - Traffic and commuting patterns
 - Expected growth
 - Meteorology
 - Geography and topography
 - Jurisdictional boundaries
 - Level of emission control on existing source

PM_{2.5} Implementation Rule Issues

- Attainment dates
- Classifications
- Reasonably available control technology
- Reasonably available control measures
- Reasonable further progress
- New Source Review
- Transportation conformity
- Contingency measures
- General conformity

Fine Particles: Summary

- Linked to serious health effects
 - Premature death, heart and lung disease
- A complex problem
 - Many types of pollutants from multiple emission sources
- EPA encourages early reductions
- EPA is committed to working with States and Tribes to meet the fine particle standards and to protect public health