

# UNLOCKING THE MYSTERIES OF AIR QUALITY



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# 4 Keys to Understanding

1. What is Pollution?
2. What is the Law?
3. Who is Involved?
4. What is Conformity?



**1<sup>st</sup> Key to Understanding:**

**What is  
Pollution?**

# 1<sup>st</sup> Key: What Is Pollution?

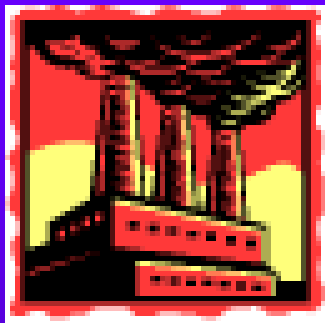
## 3 Sources of Pollution

- ◆ Stationary
- ◆ Area
- ◆ Mobile
  - On-Road
  - Off-Road

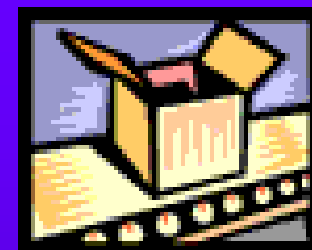


# 1<sup>st</sup> Key: What Is Pollution?

## Stationary Sources



Fixed facilities such  
as:



Factories

Power Plants

Chemical Process  
Industries

Petroleum  
Refineries





# 1<sup>st</sup> Key: What Is Pollution?

## Area Sources

Small Stationary, Non-transportation Sources such as:

- Dry Cleaners
- Bakeries
- Surface Coating Operations
- Home Furnaces
- Crop Burning



# 1<sup>st</sup> Key: What Is Pollution?

## Mobile Sources – On-Road

On-Road Vehicles such  
as:

- Cars
- Trucks
- Buses



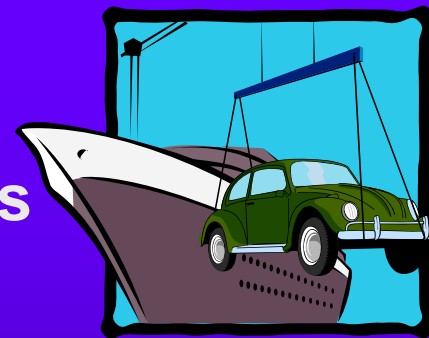
# 1<sup>st</sup> Key: What Is Pollution?

## Mobile Source – Off-Road



Trains

Ships and Boats



Airplanes



Lawnmowers

Construction Equipment



Farm Equipment



**1<sup>st</sup> Key: What Is Pollution?**



# What is Carbon Monoxide?

## 1<sup>st</sup> Key: What Is Pollution?

### Carbon Monoxide (CO)

- ◆ Odorless, colorless, gas
- ◆ A product of incomplete combustion
  - Incomplete burning of carbon in fuels such as gasoline
- ◆ Worse during the colder months
  - Night-time inversion conditions



**1<sup>st</sup> Key: What Is Pollution?**

# What is Ozone?



1<sup>st</sup> Key: What Is Pollution?

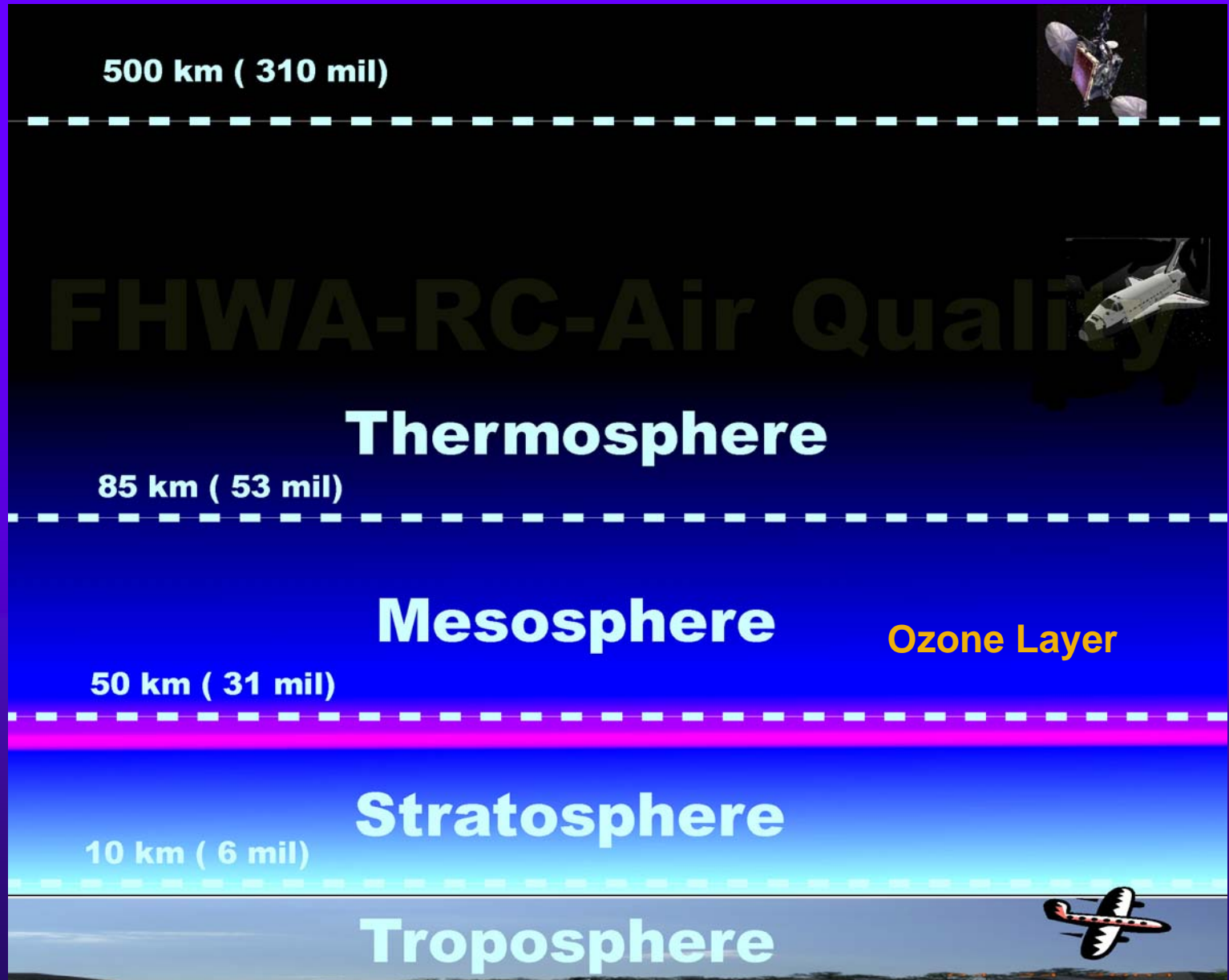
# OZONE Ingredients



**Sunlight**  
**+Heat**  
**+VOC**  
**+ NOx**  
**= Ozone**



# 1st Key: What Is Pollution?



Ground Level Ozone

# 1<sup>st</sup> Key: What Is Pollution?

## OZONE: The Good, The Bad, and The Ugly

### ◆ Good Ozone

- ozone layer
- screens out harmful
- UV rays

### ◆ Bad Ozone

- smog/haze
- harmful to elderly, children, people at risk

### Ugly

- designations



1st Key: What Is Pollution?

# Air Quality Designations

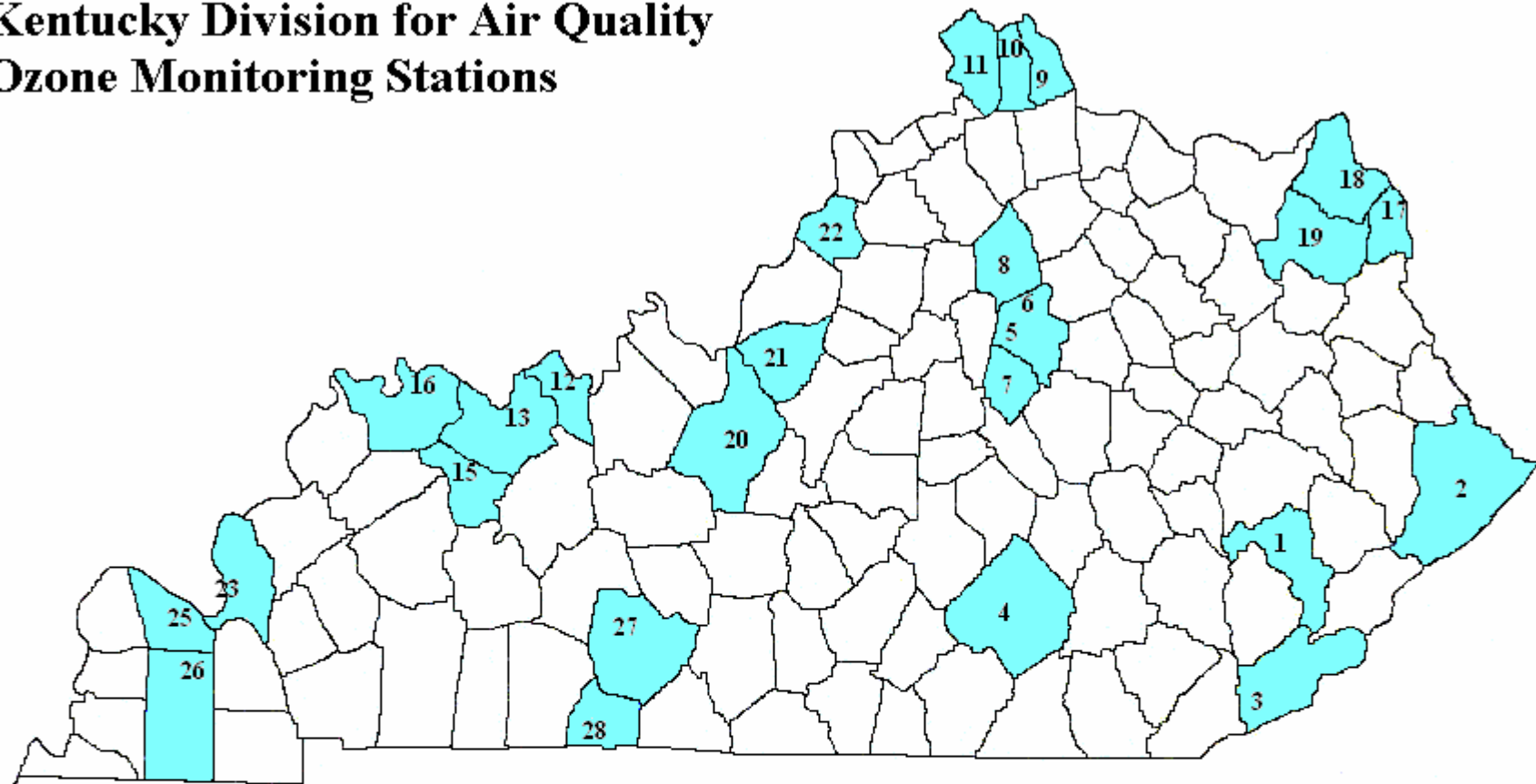
- ◆ **Attainment**
  - Has NEVER violated the NAAQS
- ◆ **Non-Attainment**
  - Is in violation of the NAAQS
- ◆ **Maintenance**
  - Has violated the NAAQS BUT has once again attained the NAAQS
  - Has a maintenance plan





# Kentucky Division for Air Quality

## Ozone Monitoring Stations



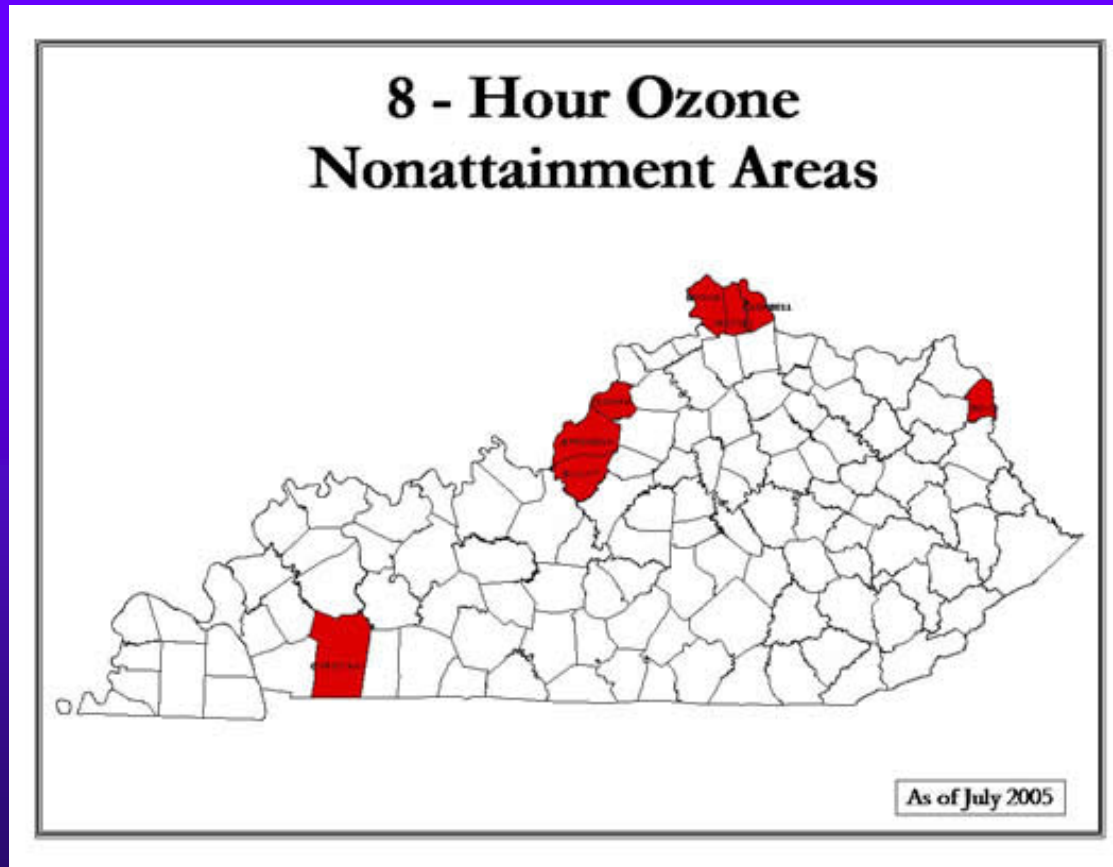
1. Hazard, Perry County Horsepark, Perry County
2. Pikeville, 101 N. Mayo Trail, Pike County
3. Middlesboro, Airport, Bell County
4. Somerset, Clifty Drive, Pulaski County
5. Lexington, Newtown Pike, Fayette County
6. Lexington, Ironworks Pike, Fayette County
7. Nicholasville, US27 Bypass, Jessamine County
8. Sadieville, Hwy 32, Scott County
9. Fort Thomas, Alexandria Pike, Campbell County
10. Covington, 1401 Dixie Hwy, Kenton County
11. Eastbend, Rabbit Hash Road, Boone County
12. Lewisport, Elementary School, Hancock County
13. Owensboro, 716 Pleasant Valley Rd, Daviess County

15. Guffie, Ky 815, McClean County
16. Baskett, Fire Department, Henderson County
17. Ashland, Holt Street, Boyd County
18. Worthington, Scott and Center, Greenup County
19. Grayson Lake, Camp Webb, Carter County
20. Elizabethtown, Miles Street, Hardin County
21. Shepherdsville, 2nd Street, Bullitt County
22. Buckner, Ky 393, Oldham County
23. Smithland, US 60, Livingston County
25. Paducah, 2901 Powell Street, McCracken County
26. Symsonia, Ky 1949, Graves County
27. Bowling Green, Oakland Elementary, Warren County
28. Franklin, DOT Garage Ky 1008, Simpson County



1st Key: What Is Pollution?

# 8-hr Ozone Designations



1. Boone
2. Boyd
3. Bullitt
4. Campbell
5. Christian
6. Jefferson
7. Kenton
8. Oldham

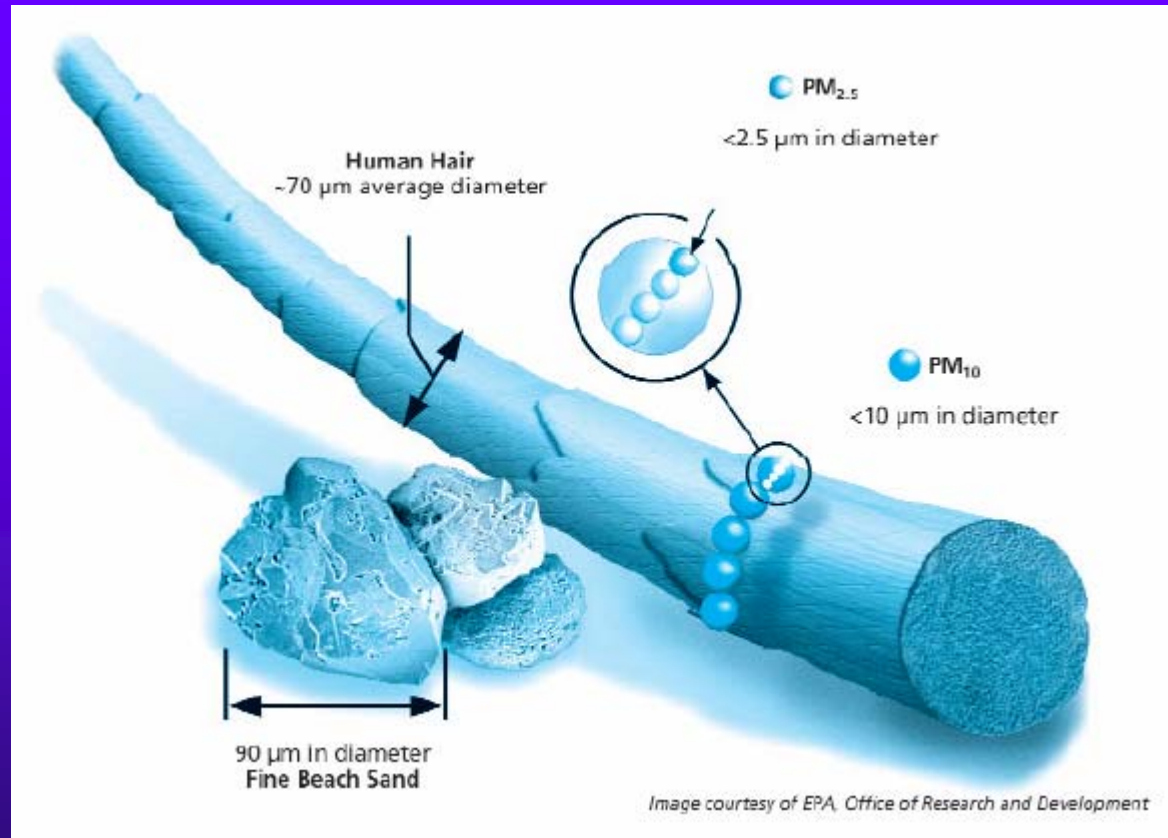


1<sup>st</sup> Key: What Is Pollution?

# What is Particulate Matter?

## 1<sup>st</sup> Key: What Is Pollution?

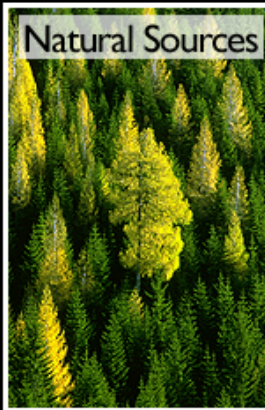
# What is Particulate Matter?



A complex mixture of extremely small solid particles and drops of liquid in the air

## 1<sup>st</sup> Key: What Is Pollution?

# Particulate Matter



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



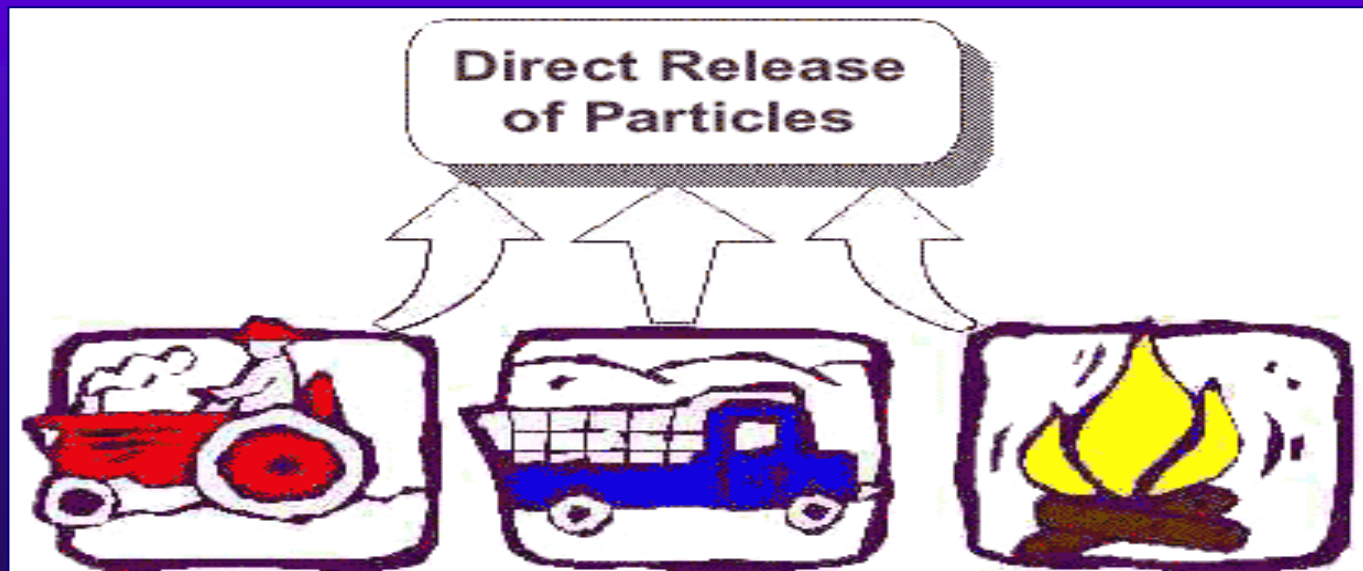


# 1<sup>st</sup> Key: What Is Pollution?

## Sources of PM<sub>2.5</sub>

### Directly Emitted Into The Air

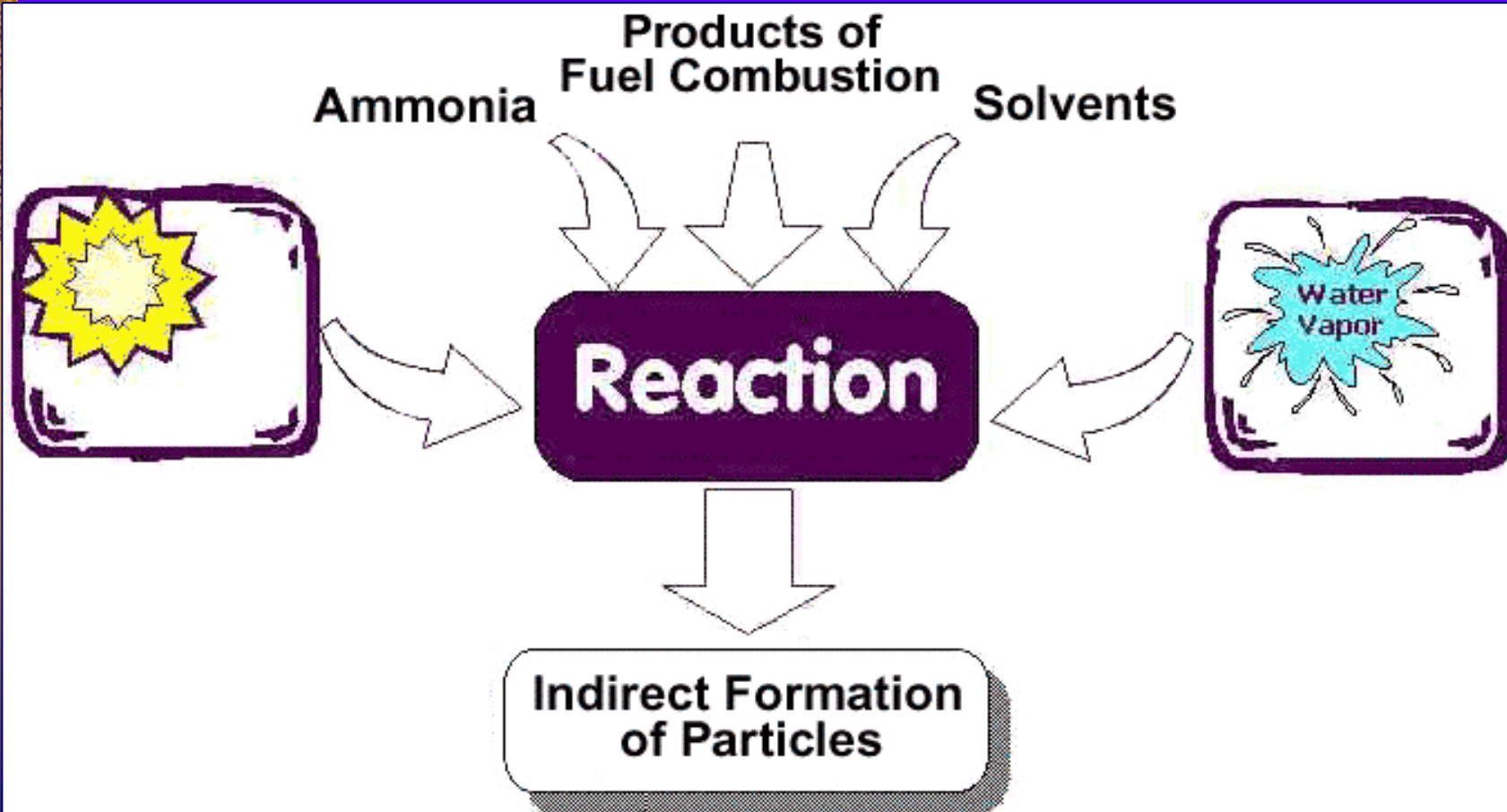
- Cars, trucks, buses
- Power plants, factories
- Construction sites
- Tilled fields, unpaved roads
- Wood burning



# 1<sup>st</sup> Key: What Is Pollution?

## Sources of PM<sub>2.5</sub>

### Indirectly Formed



# 1<sup>st</sup> Key: What Is Pollution?

Fine Particles Reduce Visibility



**Chicago - Summer 2000.**

Clear Day :  $\text{PM}_{2.5} < 5 \mu\text{g}/\text{m}^3$



# 1<sup>st</sup> Key: What Is Pollution?

Fine Particles Reduce Visibility



**Chicago - Summer 2000.**  
Hazy Day :  $\text{PM}_{2.5} = 35 \mu\text{g}/\text{m}^3$



# 1<sup>st</sup> Key: What Is Pollution?

Fine Particles Reduce Visibility

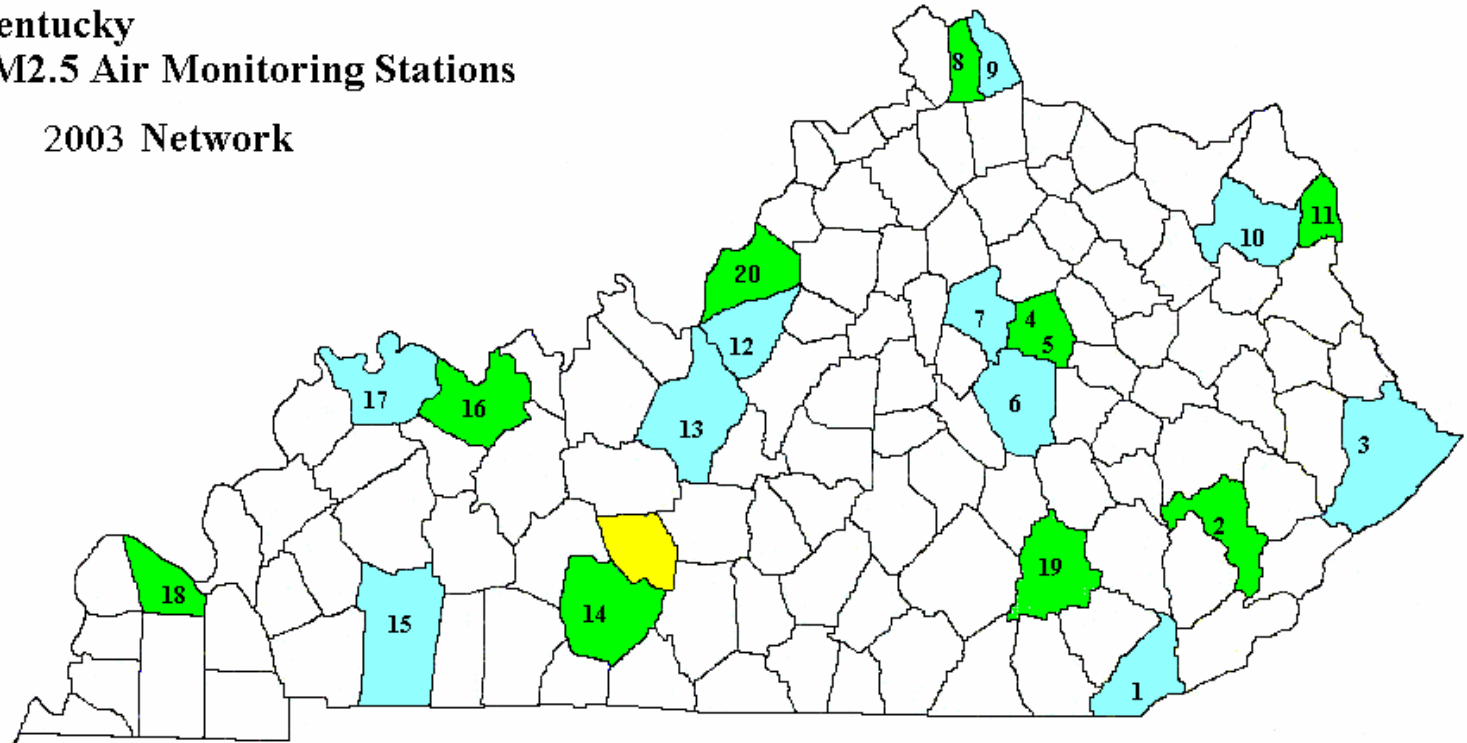


Atlanta

# 1st Key: What Is Pollution?

## Kentucky PM2.5 Air Monitoring Stations

2003 Network



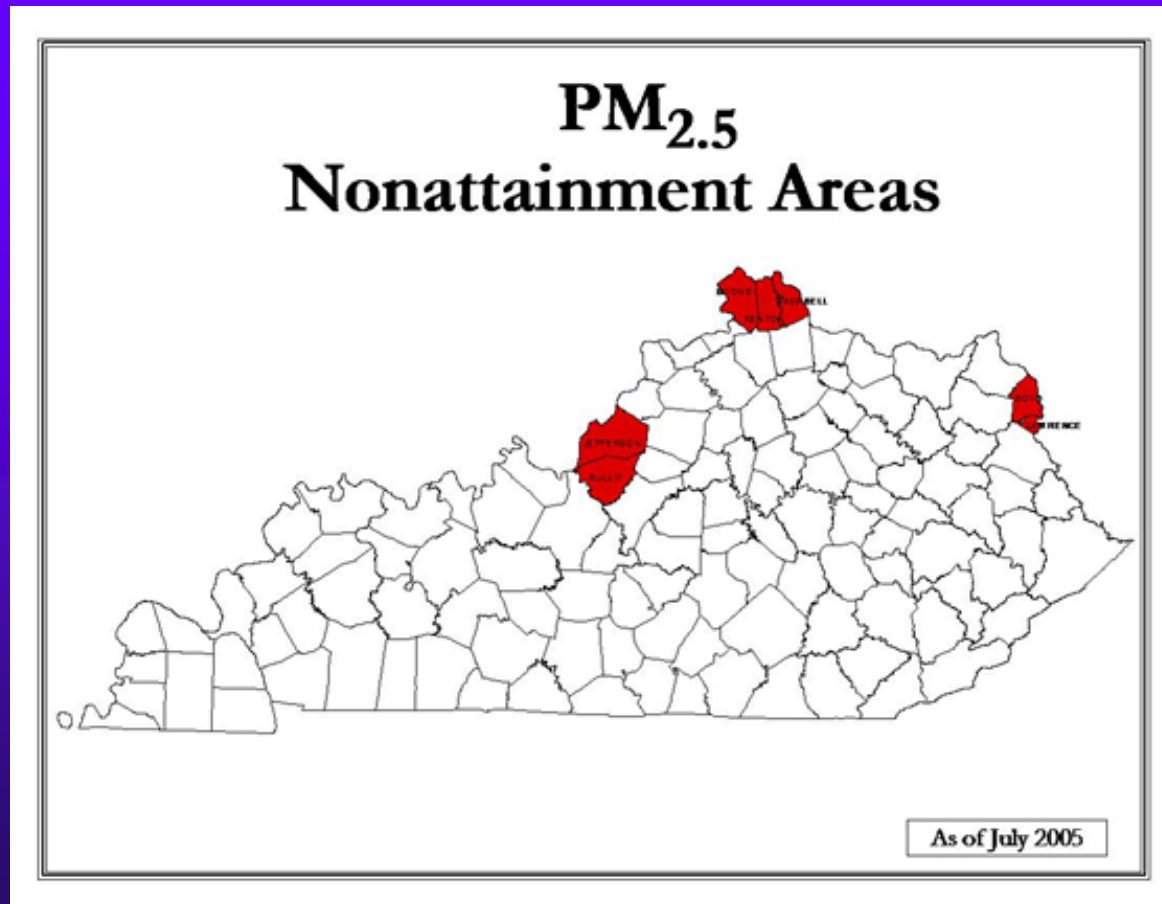
1. Middlesboro, Airport, Bell County
2. Hazard, Perry County Horsepark, Perry County
3. Pikeville, North Mayo Trail, Pike County
4. Lexington, Newtown Pike, Fayette County
5. Lexington, South Limestone, Fayette County
6. Richmond, Mayfield Elementary, Madison County
7. Frankfort, 803 Schenkel Lane, Franklin County
8. Covington, Dixie Highway, Kenton County
9. Fort Thomas, Alexandria Pike, Campbell County
10. Grayson Lake, Camp Webb, Carter County
11. Ashland, Holt Street, Boyd County
12. Shepherdsville, 2nd Street, Bullitt County
13. Elizabethtown, Miles Street, Hardin County

14. Bowling Green, Kereiakes Park, Warren County
15. Hopkinsville, Pilot Rock Road, Christian County
16. Owensboro, Ky Wesleyan College, Daviess County
17. Henderson, Bend Gate School, Henderson, County
18. Paducah, Paducah Middle School, McCracken, County
19. London, London/Corbin Airport
20. Louisville Metro

- Mass Only
- Mass and Speciation
- Improve

# 1st Key: What Is Pollution?

## PM<sub>2.5</sub> Designations



1. Boone
2. Boyd
3. Bullitt
4. Campbell
5. Jefferson
6. Kenton
7. Lawrence (p)



**2<sup>nd</sup> Key to Understanding:**

**What is the  
Law?**





## 2<sup>nd</sup> Key: What Is The Law?

### Air Pollution Control Act of 1955

Provided federal funds to conduct research and technical assistance

### Amendment of 1962

Authorized US Surgeon General to evaluate health effects from various vehicle exhaust substances

### The Clean Air Act of 1963

Replaced the 1955 Act

Provided federal research funds to both federal and outside agencies

Granted federal authority to address interstate air pollution problems

Encouraged establishment of emission standards



## 2<sup>nd</sup> Key: What Is The Law?

### Amendment of 1965

(Motor Vehicle Air Pollution Act)

Established automobile emission standards

### National Environmental Policy Act 1969

Created the Environmental Protection Agency

### Clean Air Act of 1970

Established NAAQS

Proposed new source performance standards

Established strict vehicle emission standards

Citizen's right to take legal actions against any organizations  
including the government for violation



## 2<sup>nd</sup> Key: What Is The Law?

### The Energy Supply and Environmental Coordination Act of 1974

- Loosened restriction of the CAA

- Delayed the motor vehicle emission standards of the 1970 CAA

### Amendment of the 1977 CAA

- New motor vehicle emission standards

- Time to meet MVES

- Time to meet NAAQS

- Stratospheric ozone



## 2<sup>nd</sup> Key: What Is The Law?

### Acid Precipitation Act of 1980

- Identified the causes and sources of acid precipitation

- Evaluated the environmental, social, and economic effects

- Take action to the extent necessary and practicable to limit or eliminate or remedy the harmful effects.





## 2<sup>nd</sup> Key: What Is The Law?

### Clean Air Act Amendment of 1990

Smog

Motor vehicle emissions

Toxic air pollution

Acid rain

State responsible for non-attainment area

Definite time table of MVES

Low sulfur fuel

Mandate installation of BACT

Reduction of CFCs

## 2<sup>nd</sup> Key: What Is The Law?



### Ozone 8-hr and PM2.5 NAAQS 1997

Established the 8-hour ozone standards

Established the PM2.5 standards

### Final Rule to Implement the 8-Hour Ozone National Ambient Air Quality Standards, 2004

40 CFR Parts 50, 51 and 81

## 2<sup>nd</sup> Key: What Is The Law?



**Transportation Conformity Rule Amendments  
for the New 8-hour Ozone and PM<sub>2.5</sub>  
NAAQS and Miscellaneous Revisions for  
Existing Areas, 2004**

40 CFR Part 93 - 07/01/2004

**Transportation Conformity Rule Amendment-  
Revised March, 2006**



**3<sup>rd</sup> Key to Understanding:**

**Who is  
Involved?**

**3<sup>rd</sup> Key: Who Is Involved? US EPA**



# **U.S. ENVIRONMENTAL PROTECTION AGENCY**

- ◆ **Sets National Ambient Air Quality Standards (NAAQS)**
- ◆ **Mandated to review NAAQS every 5 years**

3<sup>rd</sup> Key: Who Is Involved? US EPA

# Pollution Standards:



## ♦ Primary Standard

- Public Health (children, elderly, asthmatics)



## ♦ Secondary Standard

- Public Welfare
- Soils, Water, Crops, Vegetation
- Buildings, Property
- Animals, Wildlife
- Weather, Visibility
- Transportation

3<sup>rd</sup> Key: Who Is Involved? US EPA

# National Ambient Air Quality Standards (NAAQS)

Transportation Related\_ Pollutants  
include:

- ◆ Carbon Monoxide (CO)
- ◆ Ground Level Ozone (becomes Smog)
  - Nitrogen Oxides (NO<sub>x</sub>)
  - Volatile Organic Compounds (VOC)
- ◆ Particulate Matter
  - PM<sub>10</sub>
  - PM<sub>2.5</sub>





### 3<sup>rd</sup> Key: Who Is Involved? US EPA

## TRANSPORTATION RELATED POLLUTANTS

Pollutant	Type of Average	Concentration
CO	8-hr	9 ppm
	1-hr	35 ppm
O <sub>3</sub>	8-hr	0.08 ppm
	1-hr	0.12 ppm
PM <sub>2.5</sub>	Annual	15 µg/m <sup>3</sup>
	24-hr	35 µg/m <sup>3</sup>
PM <sub>10</sub>	Annual	50 µg/m <sup>3</sup>
	24-hr	150 µg/m <sup>3</sup>



**3<sup>rd</sup> Key: Who Is Involved? DAQ**

# **STATE AIR AGENCY**



- ◆ **Kentucky Environmental and Public Protection Cabinet's Division for Air Quality (DAQ)**
  - **Develops State Implementation Plan (SIP)**
  - **Set Emission Budgets for each maintenance area**

### 3<sup>rd</sup> Key: Who Is Involved? DAQ



## State Implementation Plan (SIP)

- ◆ States HOW the state will meet NAAQS for each pollutant
- ◆ Performs Regional Analyses
- ◆ Sets Emission Budgets for each type of pollutant
- ◆ Each Pollution Source is assigned an emission reduction target

### 3<sup>rd</sup> Key: Who Is Involved? DAQ



## Example Emission Budgets

Pollution is measured in

**TONS PER DAY!!!**



### Christian County

Pollutant	2004 (tpd)	2016 (tpd)
VOC	3.83	2.08
CO	40.56	25.31
NOx	9.53	3.83



3<sup>rd</sup> Key: Who Is Involved? KYTC

## STATE DEPARTMENTS OF TRANSPORTATION



Responsible for:

- ◆ Statewide Transportation Planning for **Rural** Areas
- ◆ Building Transportation Projects
- ◆ **NOT** exceeding the On-Road Motor Vehicle Emissions Budgets (MVEB)

## 3<sup>rd</sup> Key: Who Is Involved? **KYTC**

### Rural Areas



**KYTC Develops the:**

- ◆ **State Transportation Plan (STP)**
- ◆ **State Transportation Improvement Program (STIP)**
  - Projected Emissions must be less than those identified in SIP
  - Otherwise, there is a LAPSE and projects are not receive Federal funding.





### 3<sup>rd</sup> Key: Who Is Involved? KYTC

## 15 Area Development Districts (Rural Planning Organizations)



**3<sup>rd</sup> Key: Who Is Involved? MPO**

# **Metropolitan Planning Organizations (MPO)**



- ◆ **Federal Surface Transportation Assistance Act of 1973**
  - Populations > 50,000 must have an MPO
  - Populations > 200,000 are called Transportation Management Areas (TMA)
  - Consists of representatives from Local Governments and Transportation Authorities

**3<sup>rd</sup> Key: Who Is Involved? MPO**



## **MPO's Core Functions**

- ◆ **Establish a fair and impartial setting to make regional decisions**
- ◆ **Evaluate transportation alternatives**
- ◆ **Involve the Public**
- ◆ **Participate in Air Quality Planning**
- ◆ **AND...**



### 3<sup>rd</sup> Key: Who Is Involved? MPO

## MPO's Core Functions

#### ◆ Develop and Update

#### 4 Key Documents:

- Unified Planning Work Program (UPWP)
- Public Participation Plan (PPP)
- Metropolitan Transportation Plan (MTP)
- Transportation Improvement Program (TIP)



### 3<sup>rd</sup> Key: Who Is Involved? **MPO**

## Importance of Key Documents

#### ◆ MTP

- Future Goals, Strategies and Projects
- Updated every 5 years in attainment areas/  
every 4 years in non-attainment and  
maintenance
- Projected Emissions must be less than  
those identified in SIP
- Otherwise, there is a LAPSE and projects  
will not receive federal funding.

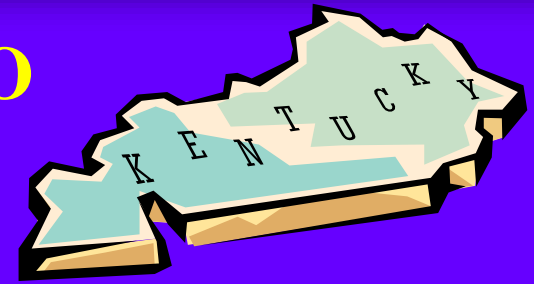
#### ◆ TIP

- Transportation Investments
- Updated every 4 years





### 3<sup>rd</sup> Key: Who Is Involved? MPO



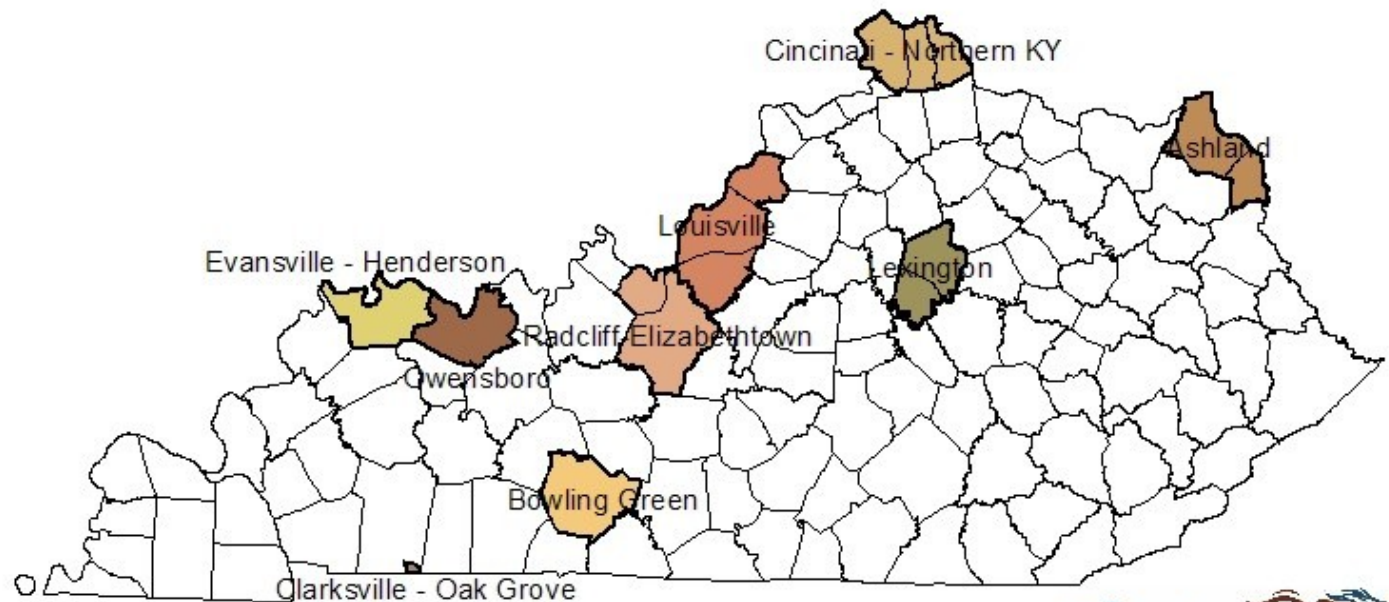
## Kentucky's 9 MPOs

- ◆ Ashland Area MPO (ASH)
- ◆ Bowling Green Area MPO (BWG)
- ◆ Cincinnati Area MPO (CIN)
- ◆ Clarksville Area MPO (CLK)
- ◆ Evansville Area MPO (EVN)
- ◆ Lexington Area MPO (LEX)
- ◆ Louisville Area MPO (LOU)
- ◆ Owensboro Area MPO (OWN)
- ◆ Radcliff/Elizabethtown MPO (REZ)

### 3<sup>rd</sup> Key: Who Is Involved? MPO

## Metropolitan Planning Organizations

### MPO Planning Boundaries



REVISED AUGUST 2005



## 3<sup>rd</sup> Key: Who Is Involved? US DOT



### Federal Highway Administration and Federal Transit Administration

- ◆ 1 of the Core Functions
- ◆ Make Conformity Determinations





**4<sup>th</sup> Key to Understanding:**

**What is  
Conformity?**



## 4<sup>th</sup> Key: What Is Conformity?

### GOAL OF

### TRANSPORTATION CONFORMITY

- ◆ To ensure that federal funding and approval of transportation projects and programs are consistent with the air quality goals established in the State Implementation Plan.





## 4<sup>th</sup> Key: What Is Conformity?

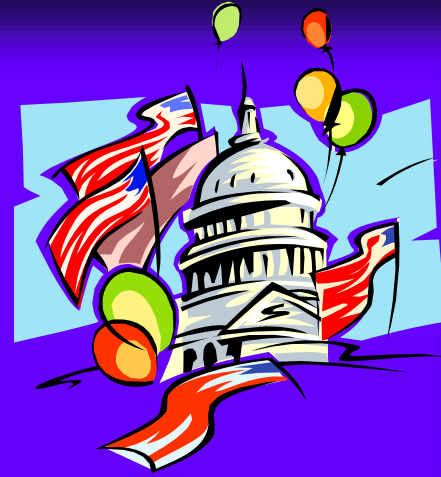
# The Link Between Air Quality and Transportation Planning

- ♦ Transportation conformity is intended to help the SIP achieve its goal which is to attain the NAAQS



## 4<sup>th</sup> Key: What Is Conformity?

# Transportation Conformity 1990 CAA – Section 176



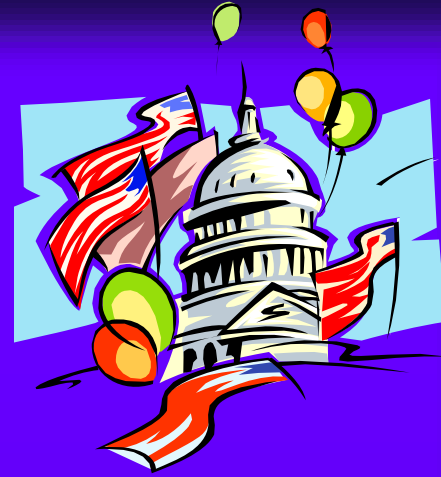
No department, agency or instrumentality of the Federal government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to a implementation plan.

No MPO shall give its approval to any project, program, or plan which does not conform to a SIP.

AND....

## 4<sup>th</sup> Key: What Is Conformity?

### Transportation Conformity 1990 CAA – Section 176



Such activities will **not**:

- Cause or contribute to any new violations
- Increase the frequency or severity
- Delay timely attainment of standards



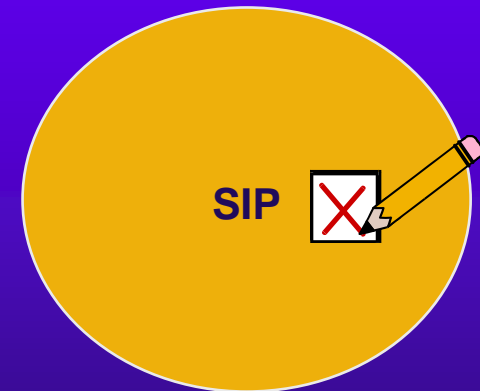
## 4<sup>th</sup> Key: What Is Conformity?

# Interagency Consultation Procedures Describe How...

MPOs, State  
DOTs, and US  
DOT

will work with:

State/local air  
agencies and US  
EPA

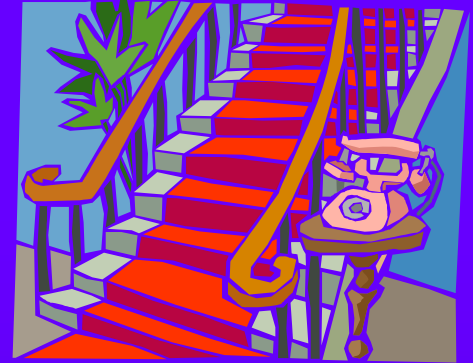


Consultation is required on the development of these plans/documents.

## 4<sup>th</sup> Key: What Is Conformity?

### Steps in Process

- ◆ IAC
- ◆ Regional Emissions Analysis
- ◆ Conformity Report
- ◆ Public Participation
- ◆ MPO Approval
- ◆ Conformity Determination





# 4<sup>th</sup> Key: What Is Conformity?

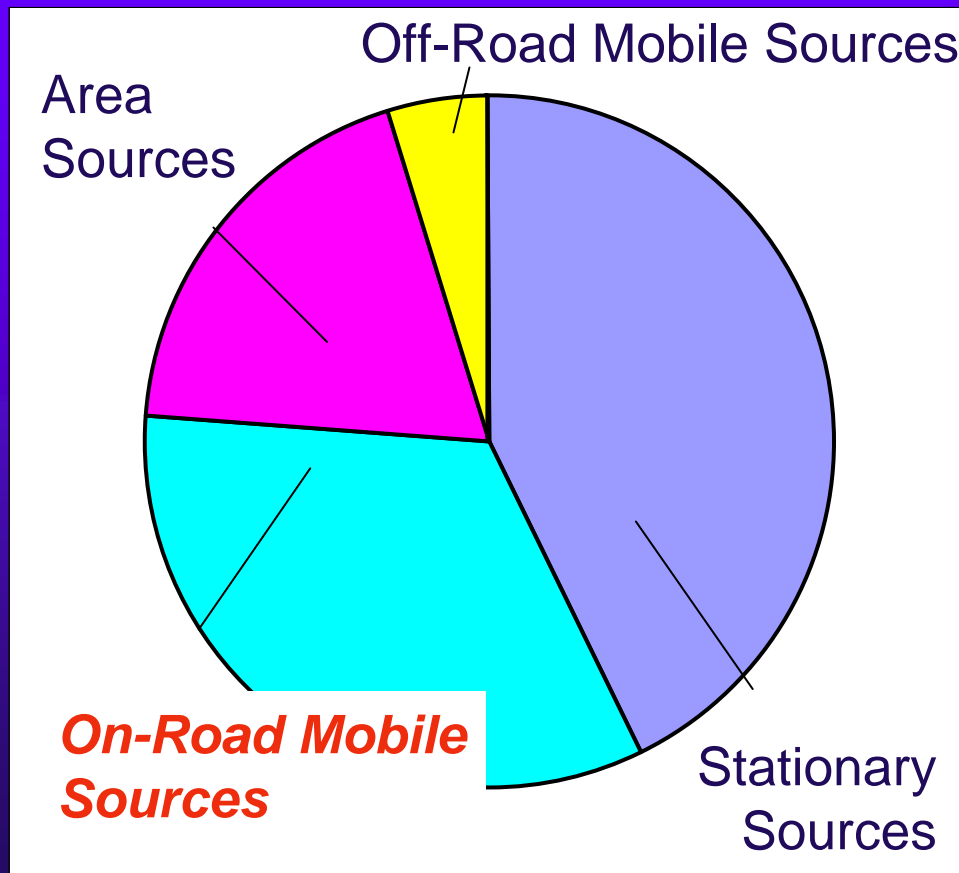
## Conformity Process and NAAQS



- ◆ Uses Key Documents to ensure that transportation projects meet air quality goals
- ◆ Once an area meets the transportation conformity requirements then projects can then be approved for federal funding

## 4<sup>th</sup> Key: What Is Conformity?

Transportation Conformity:  
Addresses Only One Piece of the Emissions Pie



Transportation conformity addresses emissions from on-road mobile sources.



# 4 Keys to Understanding

1. What is Pollution?
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# QUESTIONS?



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