

# Multipollutant Stakeholder Group Meeting

Louisville Metro Air Pollution Control District  
November 6, 2019



# Welcome

- Keith H. Talley, Sr., APCD  
Director

# Introductions

- MPSG Co-chairs and Participants

# Introduction to APCD

- Rachael Hamilton, APCD  
Assistant Director

# Air Pollution Control District

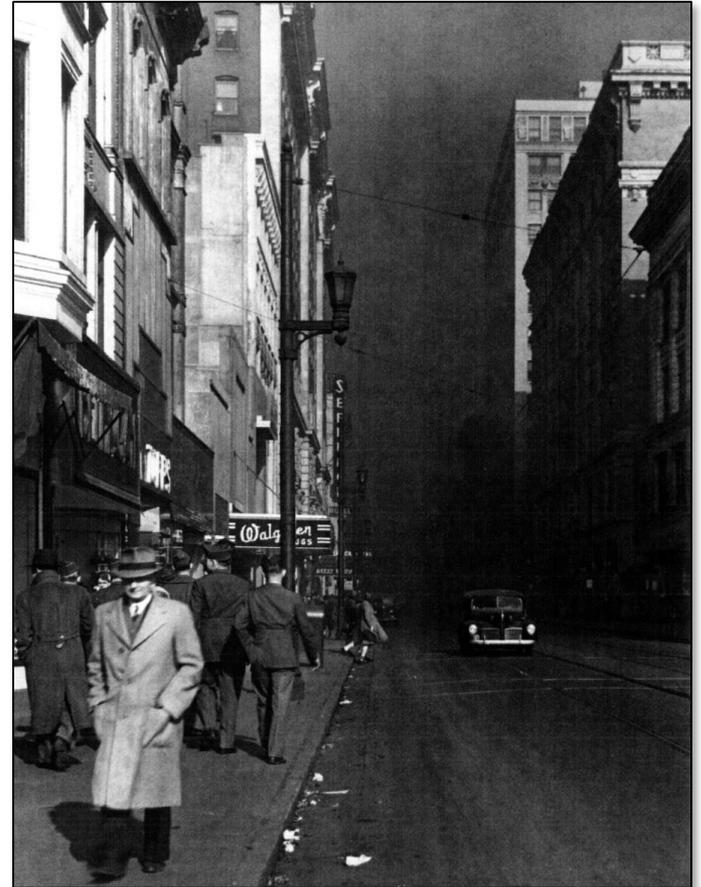
Mission Statement:

*The Air Pollution Control District protects air quality in Louisville Metro to ensure healthy air for breathing, economic security, and prosperity for all Louisvillians.*



# Air Pollution Control

- 1945 – Louisville Smoke Commission established
- 1952 – Air Pollution Control District of Jefferson County formed (KRS Chapter 77)
- 1956 – Air pollution control study understand pollution conducted in Rubbertown
- 1970 – Environmental Protection Agency (EPA) established



*Fourth Street 1943*

# Air Pollution Control



*Louisville Skyline August 1973*

- 1975** – Corporate Average Fuel Economy (CAFE) fuel mileage standards issued
- 1984** – Vehicle Emissions Testing (VET) program launched
- 1995** – Louisville gas stations required to sell reformulated gasoline
- 1999** – Air Quality Index (AQI) developed to report current and forecasted air quality

# Air Pollution Control

- 2005 – Strategic Toxic Air Reduction Program (STAR) adopted
- 2014 – APCD establishes Kentucky's first near-road air monitoring site at I-264/I-65
- 2017 – APCD partners with the EPA to test advanced air monitoring technology in Rubbertown; air toxics monitoring Auto GC
- 2018 – APCD launches *Clearing the Air* Workshop Series



# Who We Are

- To whom do we report?
  - The Community
  - Environmental Protection Agency
  - Ky. Division for Air Quality
  - Air Pollution Control Board
  - Louisville Metro Government
- How are we funded?
  - Federal Grants
  - Permit Fees
  - Emission Fees
  - Program Fees
  - Louisville Metro General Fund

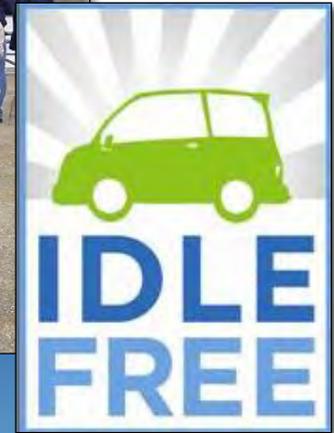
## APCD Goals

Ensure healthy air for  
breathing

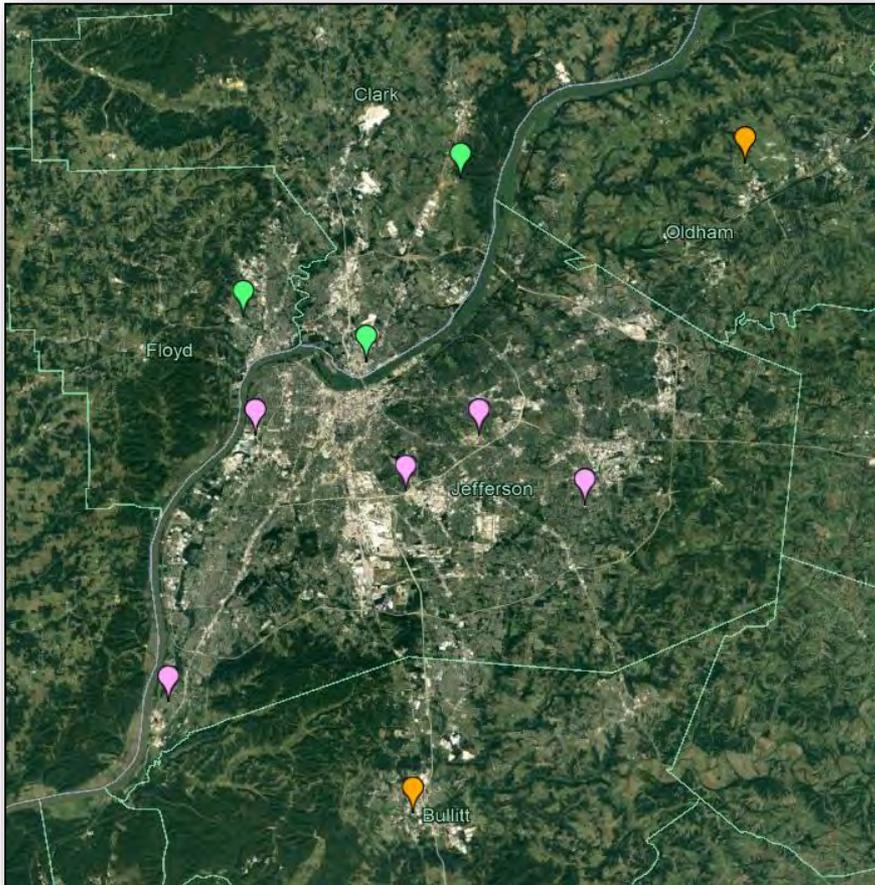
Help local businesses meet  
air quality standards

# What We Do

- Collect information/data
- Administer rules
- Issue and enforce permits
- Educate and assist
- Policy development



# Louisville Area Air Monitoring Network



## Air quality monitor operators:

- Louisville Metro Air Pollution Control District (**pink** markers)
- Kentucky Division for Air Quality (**orange** markers)
- Indiana Department of Environmental Management (**green** markers)

# What do we monitor?

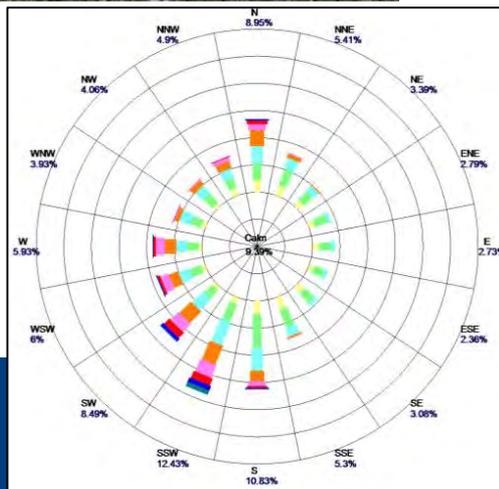
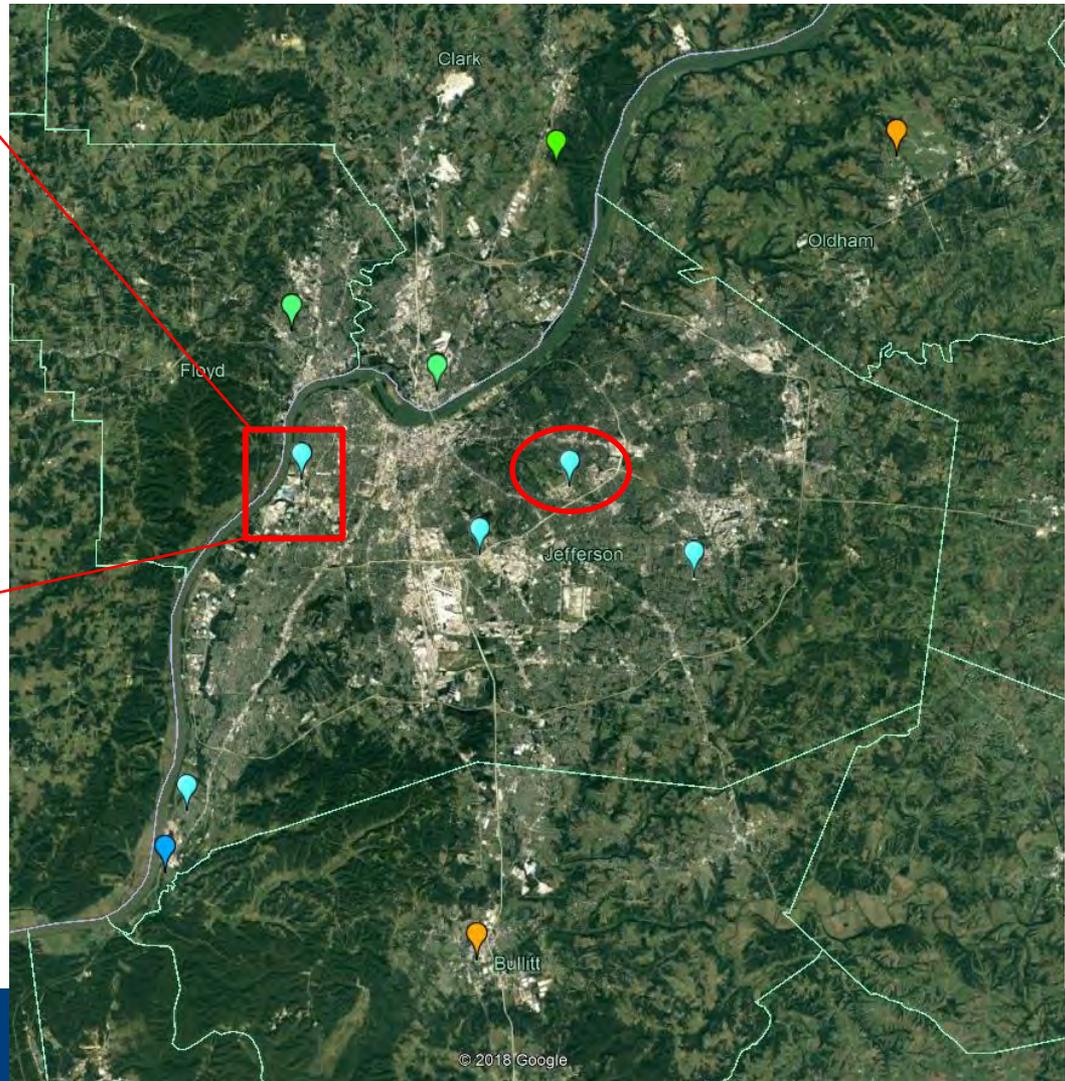
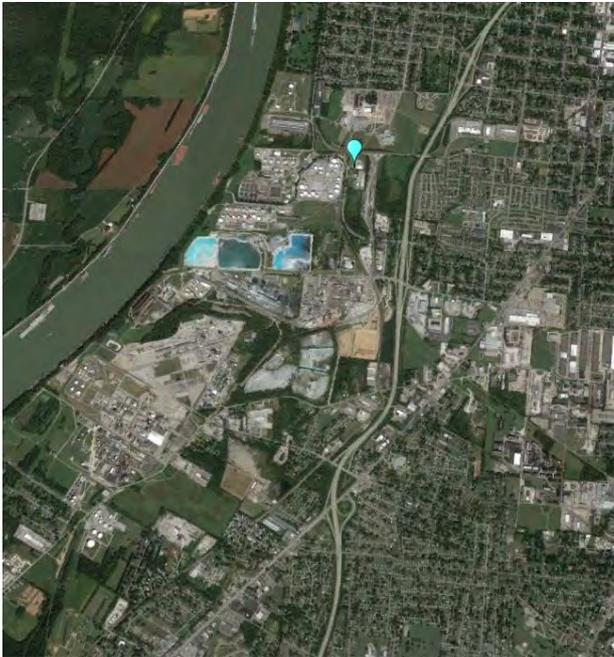
- The Clean Air Act requires EPA to set NAAQS (40 CFR part 50)
- EPA sets NAAQS for **six principal pollutants**, which are called **“criteria” air pollutants**:
  - Carbon Monoxide
  - Lead
  - Particulate Matter
  - Oxides of Nitrogen
  - Sulfur Dioxide
  - Ozone



# Air Toxics / PAMS Monitoring

- In addition to Criteria pollutant monitoring, APCD now monitors for Volatile Organic Compounds (VOCs)
- Objectives
  - Characterize ambient VOC concentrations in the vicinity of Rubbertown community
  - Evaluate photochemically reactive compounds in support of ozone reduction efforts (Photochemical Assessment Monitoring Station – PAMS)

# Air Toxics / PAMS Monitoring

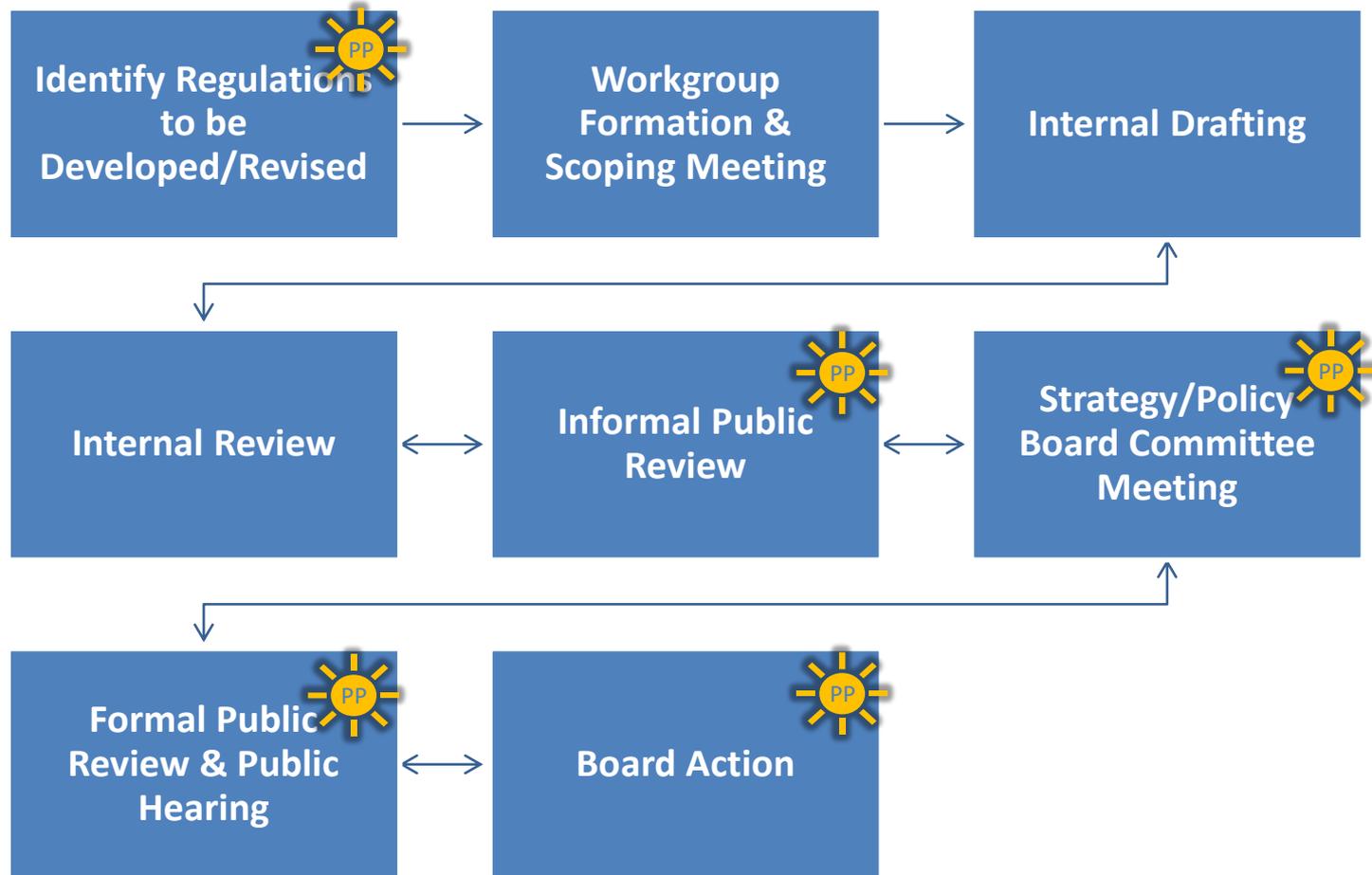


# Regulatory Authority

- APCD's regulations must be at least as stringent as state and federal laws, but can be more stringent where needed
- State and local air pollution agencies take the lead in carrying out the Clean Air Act
- [Kentucky Revised Statutes \(KRS\) Chapter 77](#)



# Regulatory Program Development



# Permits

- Permits specify the many air pollution regulations applicable to the source
- Permits explain how the source will comply with the regulations
  - Ex: Emissions
- More like a contract than a building permit
  - An agreement between the APCD and a regulated entity



# What's in a permit?

- Statement of Basis (summary)
- Standards
  - Many are specifically prescribed in the regulations
  - Some are developed during the permitting process
  - They are not just numeric standards
- Monitoring/Recordkeeping
  - Production rates, temperature, pressure, material contents
- Reporting
- Testing (initial or periodic; 3rd party testers; EPA methods)



# The Strategic Toxic Air Reduction (STAR) Program

- Regulatory program seeking to reduce harmful contaminants in Louisville's air
- Lists toxic air contaminants (TACs)
- Establishes framework for estimating risks associated with toxic air contaminants



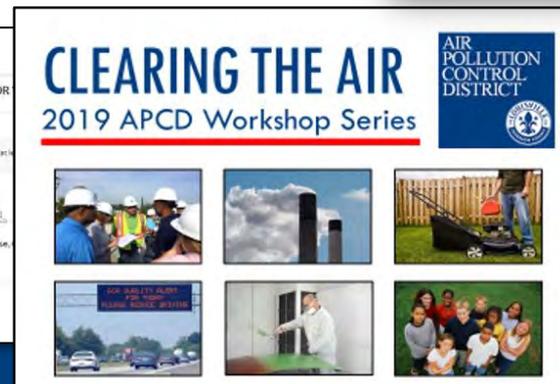
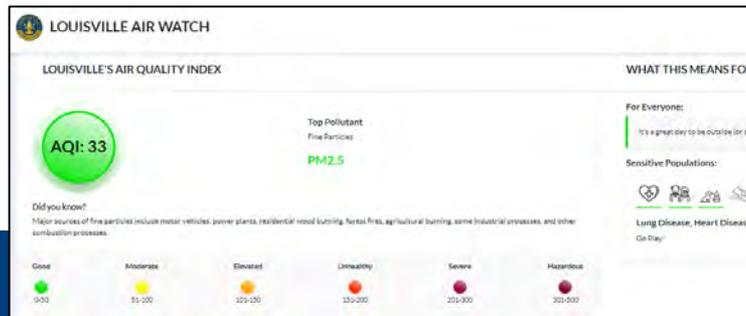
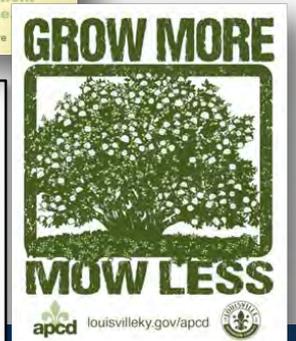
# Ensuring Compliance

- Perform Industrial Inspections and Review Periodic Reports
- Perform Investigations into community issues like odors and dust
- Provide Compliance Assistance to help people follow the rules
- When/if necessary, use Enforcement to compel compliance



# Public Outreach and Engagement

- [Kentuckiana Air Education \(KAIRE\)](#)
- [Lawn Care for Cleaner Air & Grow More Mow Less](#)
- [Clearing the Air Workshop Series](#)
- [Louisville Air Watch](#)
- Partnership and participation with community organizations



# MPSG Overview

- Michelle King, APCD Director of Program Planning and Executive Administrator

# APCD's Stakeholder Involvement

- Air Quality Task Force (2003-2006)
- STAR Regulation 5.30 Stakeholder Group (2006-2007)
- Fine Particle Air Quality Task Force (2007)
- Idling Reduction Working Group (2008)
- APCD Multipollutant Stakeholder Group (2019)



# Multipollutant Stakeholder Group

Gain recommendations for next steps Louisville can take to **improve air quality AND reduce health impacts associated with air pollution exposure**

Convene a **broad range of community stakeholders** to discuss current air quality challenges and opportunities

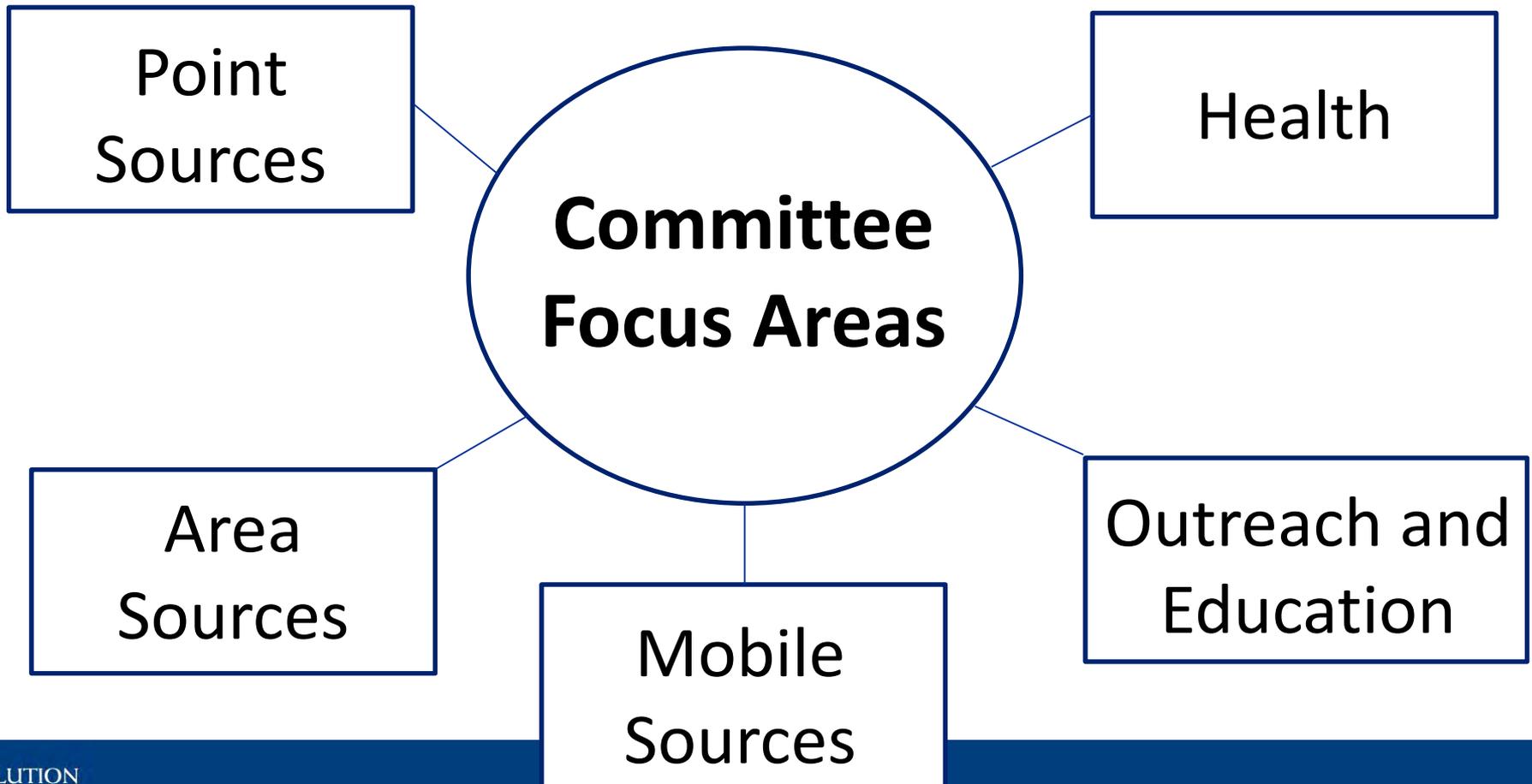
# Multipollutant Stakeholder Group

## Goals

- Develop recommendations to reduce emissions of ozone precursors in order to come into attainment of the 2015 8-hour Ozone NAAQS, with a focus on strategies that may achieve co-benefits of air toxics and fine particulate reductions.
- Identify quantifiable emission reduction strategies – voluntary and regulatory – from the following source sectors: Point, Area, Mobile.
- Identify voluntary programs and community initiatives to reduce emissions and exposure in order to reduce health risks.
- Recommend programs, collaborations, etc. that will raise awareness of air quality impacts of local activities and the health impacts associated with them.



# Multipollutant Stakeholder Group



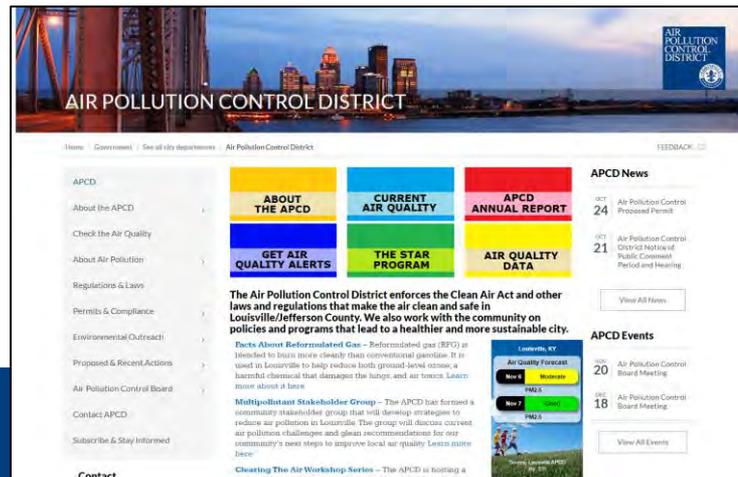
# MPSG Process

- **MPSG Convenings**
  - Air quality overview
  - MPSG process information
  - Ozone Formation Study
  - Emissions Inventory overview
  - Consensus-building on recommendations and priorities
- **Committees**
  - Source sector-specific discussions and data
  - Source-specific controls and/or reduction strategies
  - Exposure reduction strategies
  - Public health benefits
  - Awareness and education ideas



# MPSG Resources

- “Ground Rules”
  - Encourage productive dialogue and respectful information sharing
- Hopper – questions, suggestions, feedback...
- Childcare for meetings upon request (in advance)
- APCD Website
  - \*\*\* [MPSG page](#) \*\*\*
  - Air quality data
    - [Monthly reports](#)
    - [Real-time monitoring data](#)
  - Engagement Programs
    - [Clearing the Air Workshops](#)



# Louisville's Air Quality

- Billy DeWitt, APCD Air Monitoring Program Manager

# National Ambient Air Quality Standards (NAAQS)

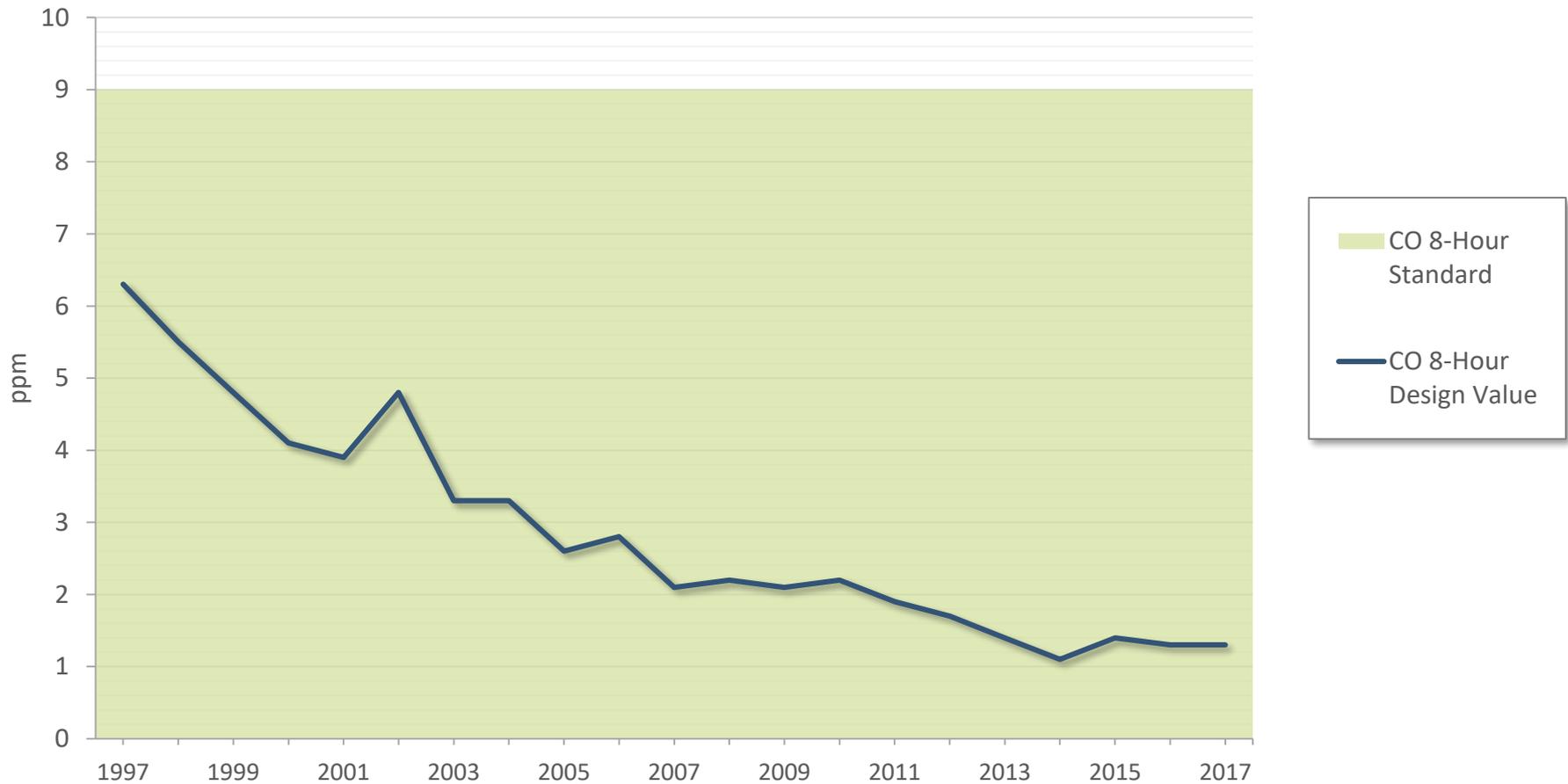
- Carbon Monoxide
- Lead
- Nitrogen Dioxide
- Sulfur Dioxide
- Particulate Matter
- Ozone



# Louisville's Current NAAQS Status

Pollutant	Standard	Averaging Time	Attainment Status
Carbon Monoxide	9 ppm	8-hour	Attainment
	35 ppm	1-hour	Attainment
Lead	0.15 $\mu\text{g}/\text{m}^3$	Rolling 3-month Average	Attainment
Nitrogen Dioxide	53 ppb	Annual Average	Attainment
	100 ppb	1-hour	Attainment
Particulate Matter (PM10)	150 $\mu\text{g}/\text{m}^3$	24-hour	Attainment
Particulate Matter (PM2.5)	12.0 $\mu\text{g}/\text{m}^3$	Annual Average	Attainment
	35 $\mu\text{g}/\text{m}^3$	24-hour	Attainment
Ozone	0.070 ppm	8-hour	Nonattainment
Sulfur Dioxide	75 ppb	1-hour	Partial County Nonattainment

# Louisville's CO History

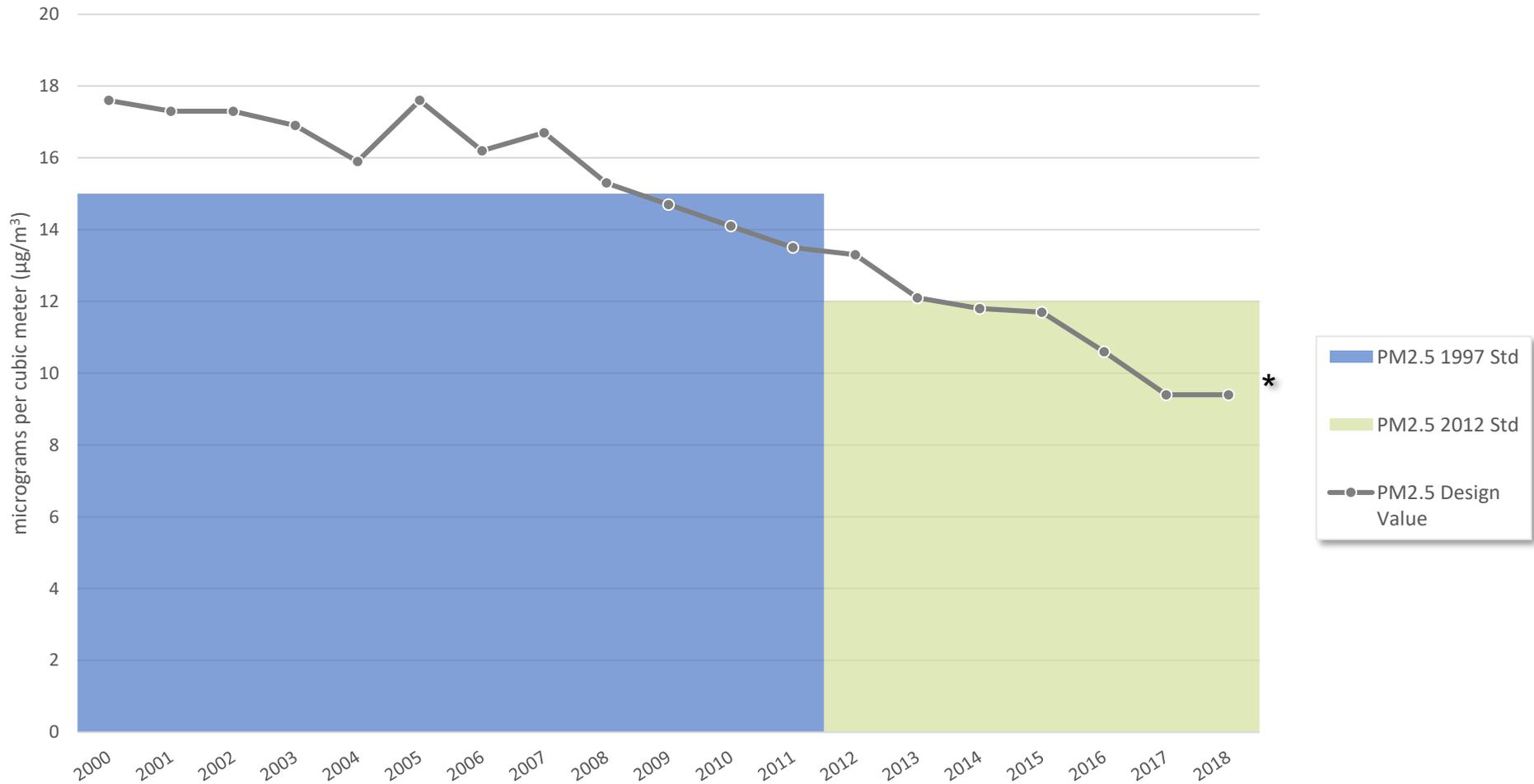


# Louisville's SO<sub>2</sub> History



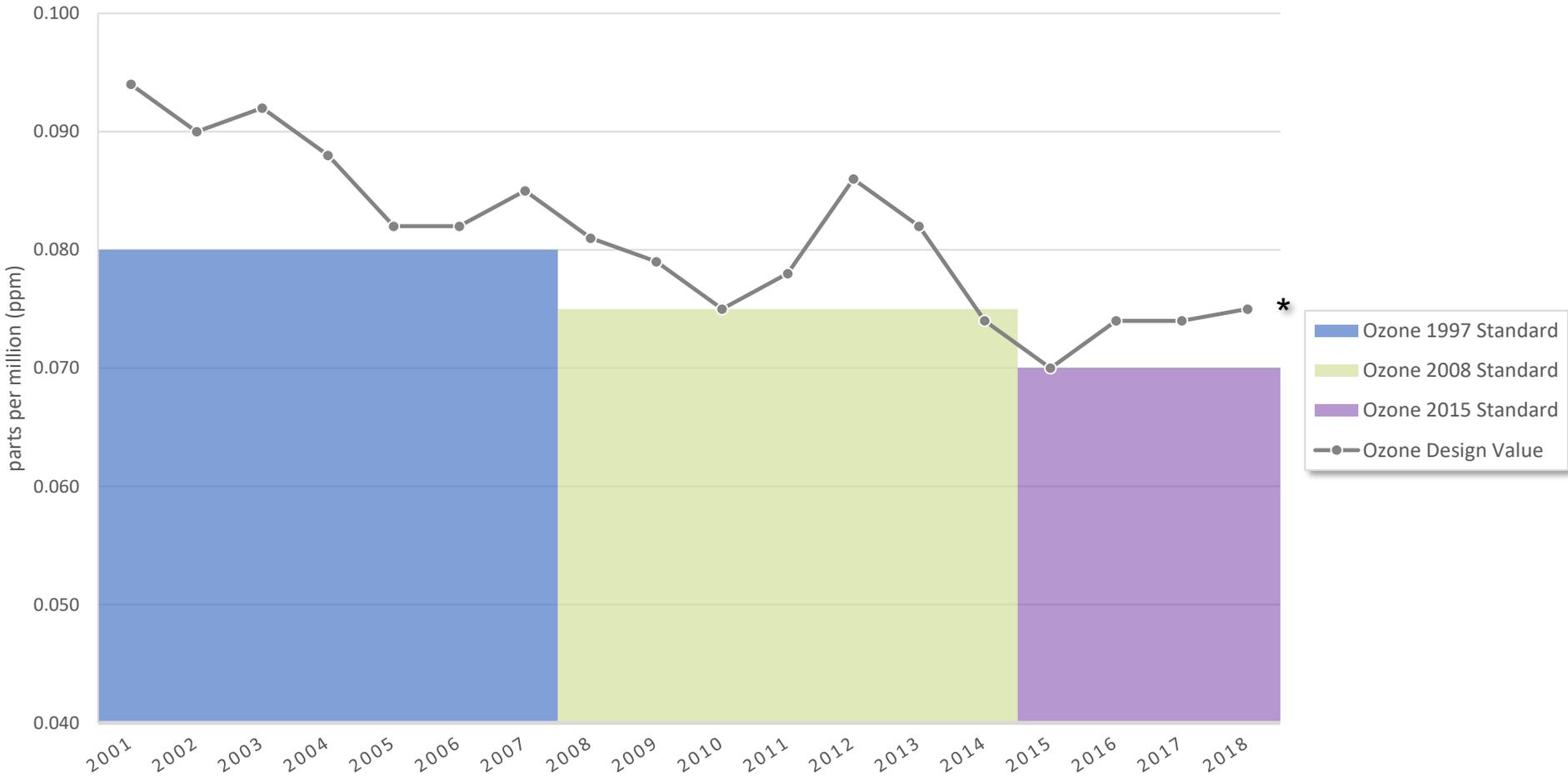
\*2018 Design Value – 18 ppb

# Louisville's Fine Particulate History



\*2018 Design Value –  $9.4 \mu\text{g}/\text{m}^3$

# Louisville's Ozone History



\*2018 Design Value – 0.075ppm

# Air Quality Index

- The AQI is calculated for four Criteria Pollutants:
  - Ozone
  - Particle pollution
  - Carbon monoxide
  - Sulfur dioxide
- AQI value of 100 generally corresponds to the NAAQS. **At or below 100 are generally thought of as satisfactory.**



# A Guide to the AQI

AQI Values	Actions to Protect Your Health From Ozone
Good (0 - 50)	None
Moderate (51 - 100*)	Unusually sensitive people should consider reducing prolonged or heavy outdoor exertion.
Unhealthy for Sensitive Groups (101 - 150)	The following groups should reduce prolonged or heavy outdoor exertion: <ul style="list-style-type: none"><li>- People with lung disease, such as asthma</li><li>- Children and older adults</li><li>- People who are active outdoors</li></ul>
Unhealthy (151 - 200)	The following groups should avoid prolonged or heavy outdoor exertion: <ul style="list-style-type: none"><li>- People with lung disease, such as asthma</li><li>- Children and older adults</li><li>- People who are active outdoors</li></ul> Everyone else should limit prolonged outdoor exertion.
Very Unhealthy (201 - 300)	The following groups should avoid all outdoor exertion: <ul style="list-style-type: none"><li>- People with lung disease, such as asthma</li><li>- Children and older adults</li><li>- People who are active outdoors</li></ul> Everyone else should limit outdoor exertion.

# Louisville & Air Toxics

1940s

WWII rubber manufacturing:  
“Rubbertown”

2005

Strategic Toxic Air Reduction (STAR) Program

2016

APCD began planning for air toxics monitoring...

2000-2001

West Louisville Air Toxics Study (WLATS)

2005-2013

University of Louisville & WJCCTF TO-15 air toxics monitoring

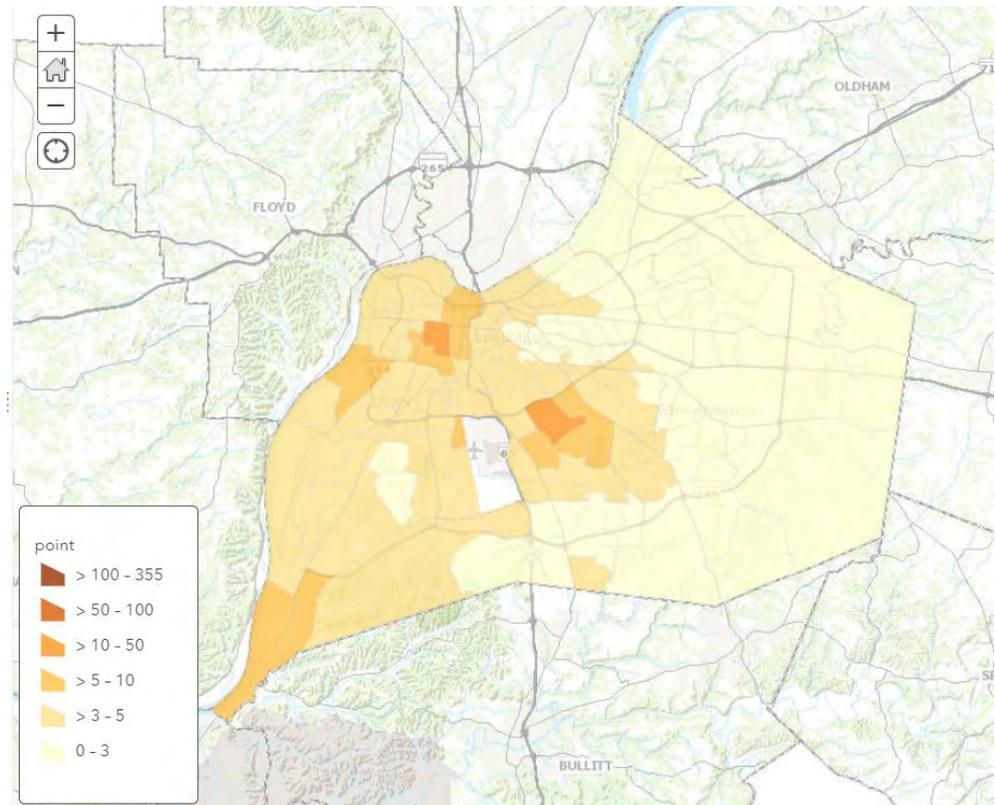
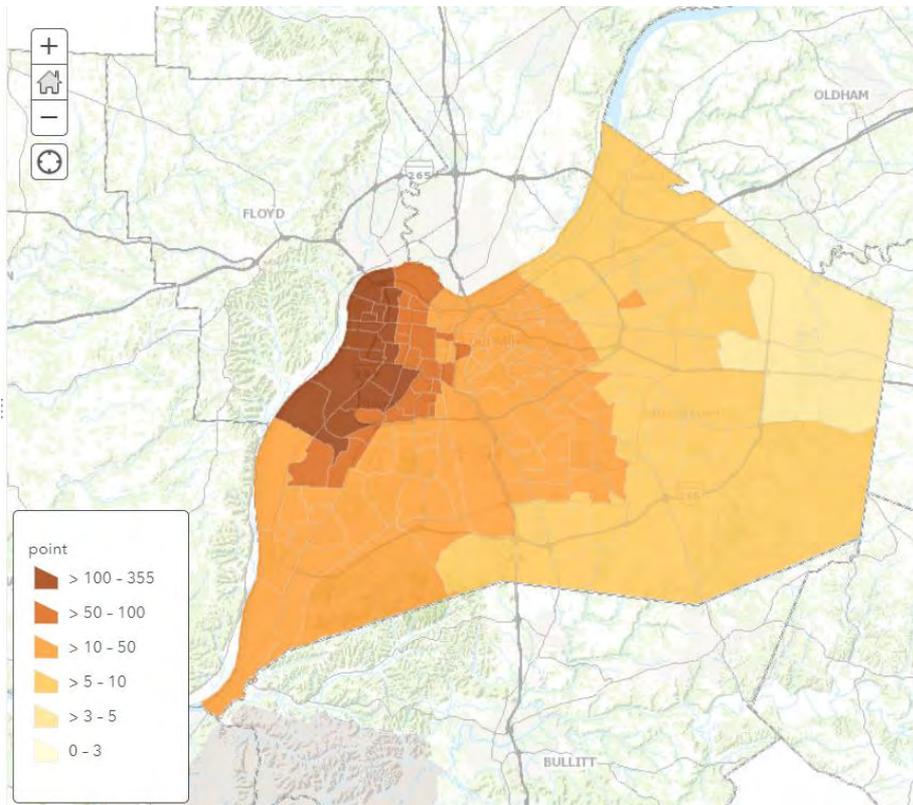
# Total Air Toxics 2005 - 2017

Jefferson County, KY Sources	2005 Total Air Releases in Pounds	2017 Total Air Releases in Pounds	% Change
Electric Generating Utilities (EGUs)	4,703,167	851,342	-82% Decrease
Non-EGUs	3,443,604	1,309,085	-62% Decrease
Total	8,146,770	2,160,427	-73% Decrease

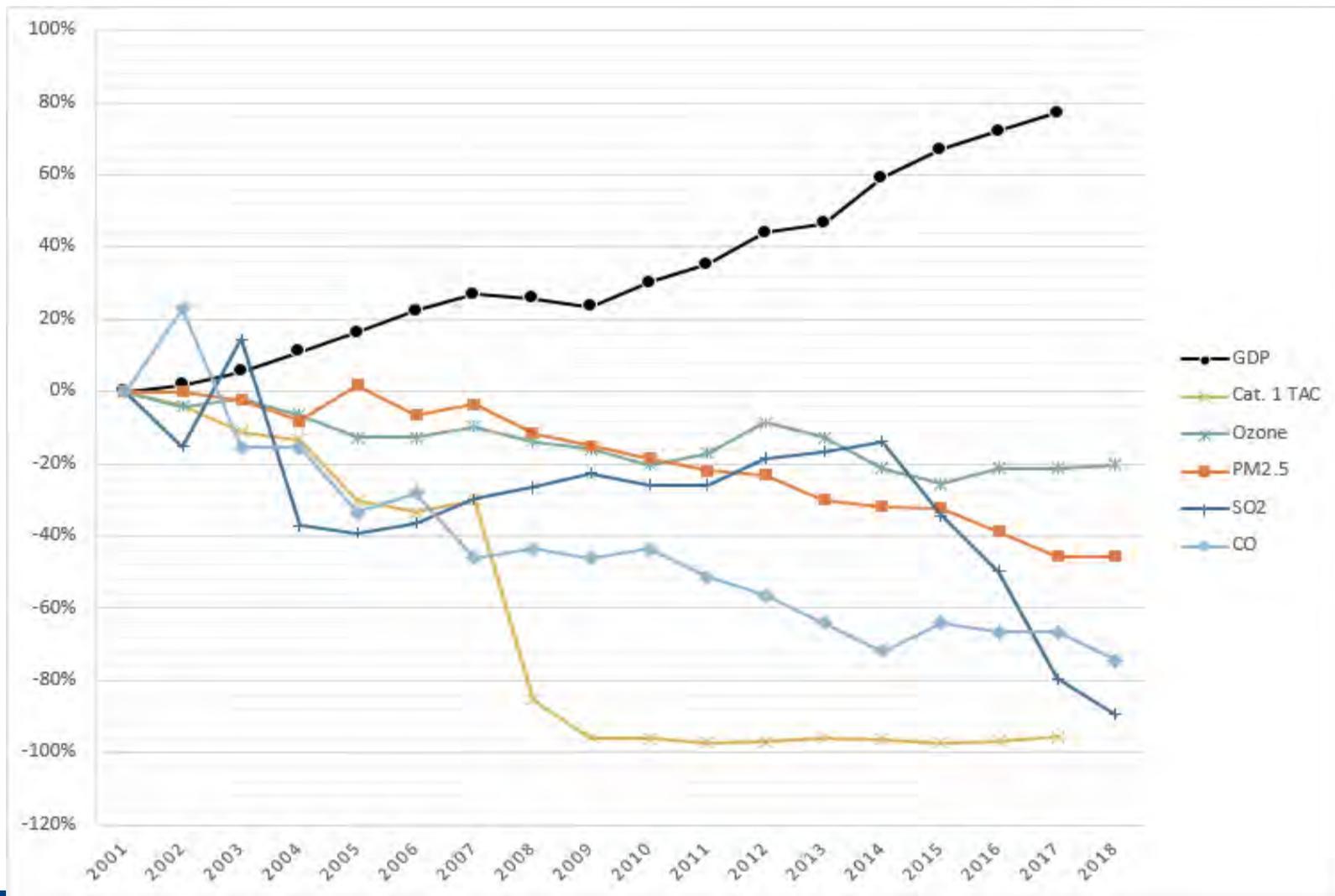
Source: [EPA Toxics Release Inventory](#)

# Air Toxics Progress:

## 2005 v 2014 National Air Toxics Assessment – Point Sources



# Heading in the right direction...



# Ozone – a Deeper Dive

- Byron Gary, APCD Regulatory Coordinator

# Ozone Formation

# Ground-level Ozone vs. Stratospheric Ozone

- Ground-level Ozone
  - “Bad” ozone
  - Colorless
  - Highly irritating gas
  - Forms just above the earth’s surface
  - Secondary pollutant
    - Created via a chemical reaction
- Stratospheric Ozone
  - “Good” ozone
  - Stratospheric layer protects from the sun’s ultraviolet rays

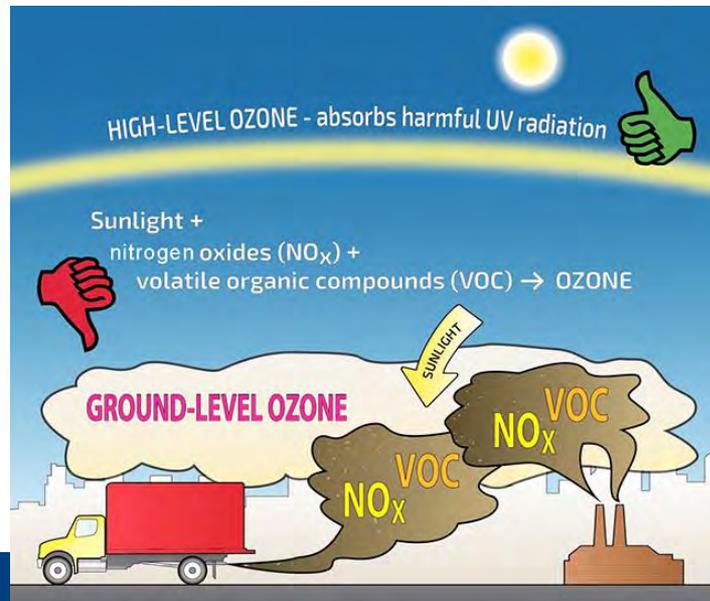
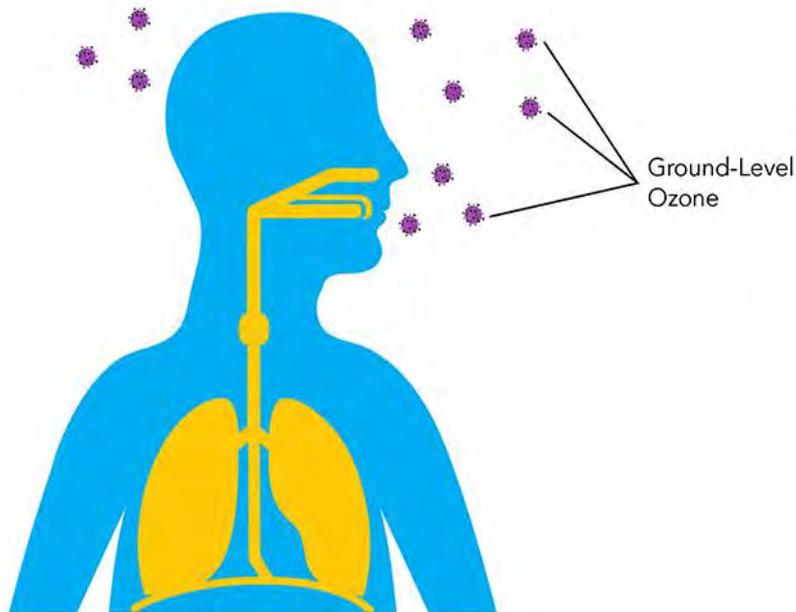


Photo: Washington State Department of Ecology

# Health Effects



**IF YOU ARE ACTIVE AND EXERCISE OUTDOORS...** ↓

OZONE CAN CAUSE YOU BREATHING DIFFICULTY AND EYE IRRITATION.

**IF YOU ARE YOUNG OR ELDERLY...** ↓

OZONE CAN CAUSE REDUCED RESISTANCE TO LUNG INFECTIONS AND COLDS.

**IF YOU ARE ASTHMATIC...** ↓

OZONE CAN TRIGGER ATTACKS.

**IF YOU SUFFER FROM RESPIRATORY ILLNESS...** ↓

OZONE CAN CAUSE WORSENERD SYMPTOMS OF COPD (CHRONIC OBSTRUCTIVE PULMONARY DISEASE) OR CHRONIC BRONCHITIS

<https://simplestepsbetterair.org/get-smart-about-ozone/>

# Environmental Effects

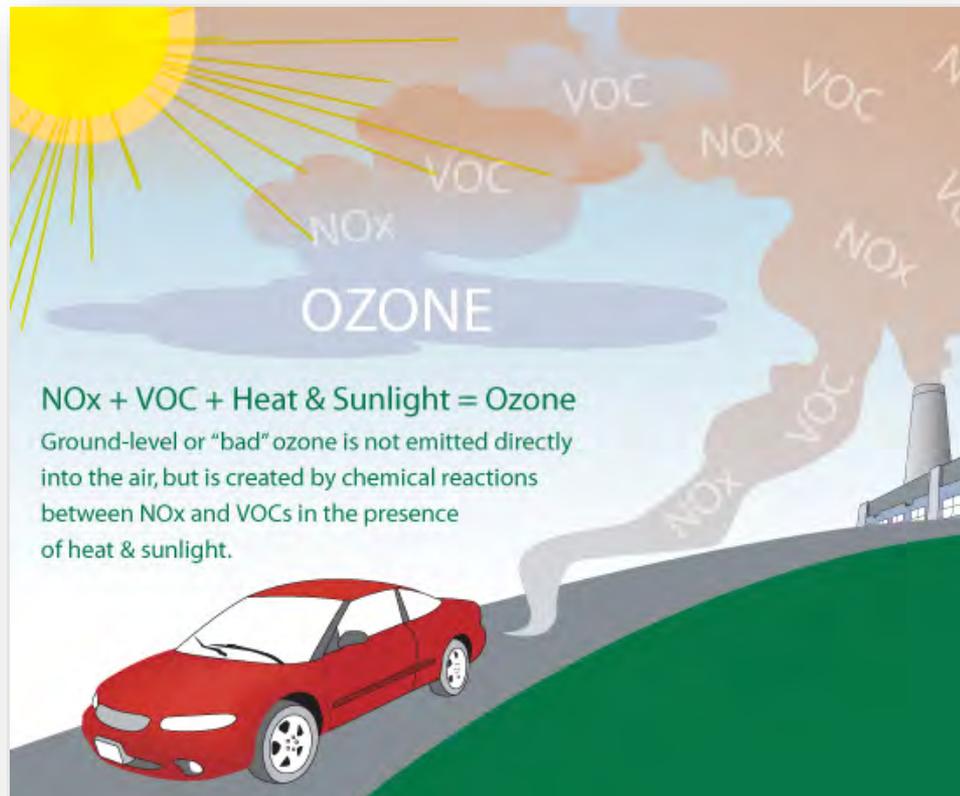
- Impacts sensitive vegetation and ecosystems
  - Slows plant growth
  - Increases plant risks of disease or infection
  - Reduces photosynthesis
- Loss of species diversity
- Changes habitat quality



*Photos: Black Cherry and Tulip Poplar*

# How is ground-level ozone formed?

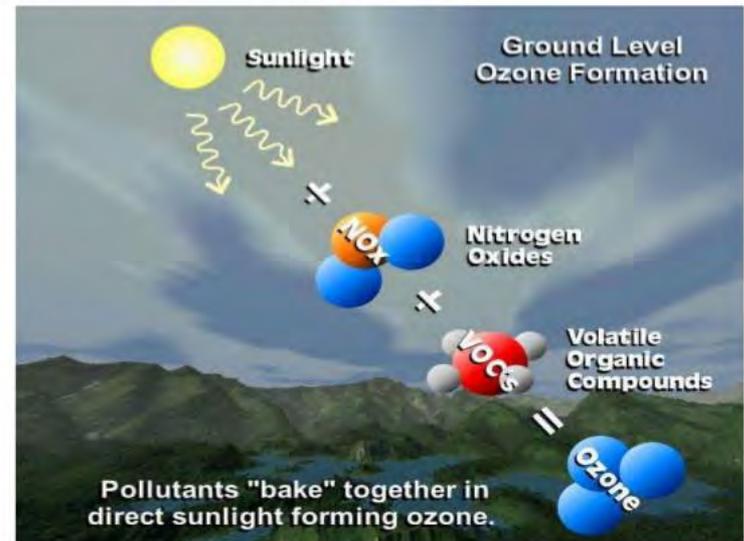
Ground-level Ozone:  $\text{NO}_x + \text{VOCs} + \text{Sunlight} = \text{O}_3$



# Meteorology

- Assists with the chemical reaction that creates “bad” ozone
- Warm, sunny, dry and stagnant days can create more ground-level ozone
- Can move through a region slowly and accumulate in areas downwind of sources

## Chemistry



# Precursors



# Oxides of Nitrogen (NO<sub>x</sub>)



- From a family of poisonous, highly reactive gases
- Primarily gets in the air from the burning of fuel
- **Contributes to the formation of ground-level ozone (“ozone precursor”)**
- Sources: Emitted from cars, trucks, buses, power plants, and off-road equipment

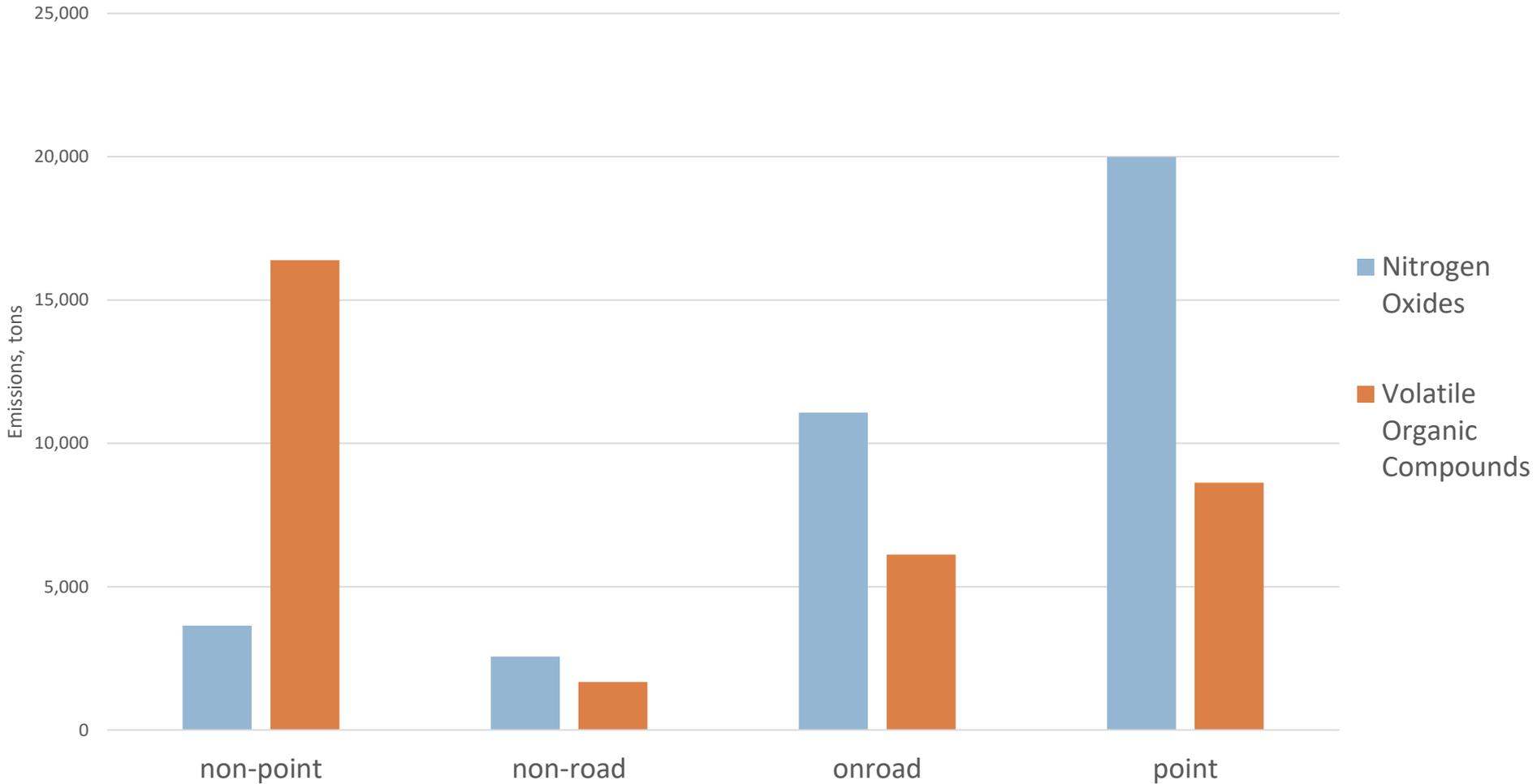
# Volatile Organic Compounds (VOCs)



- Organic compounds that easily become vapors or gases
- **NOT** a criteria pollutant
- Sources: Gasoline engines and fueling, solvents, paints, industry, consumer products, plants & soil
- Various reactivities
- Various toxicities

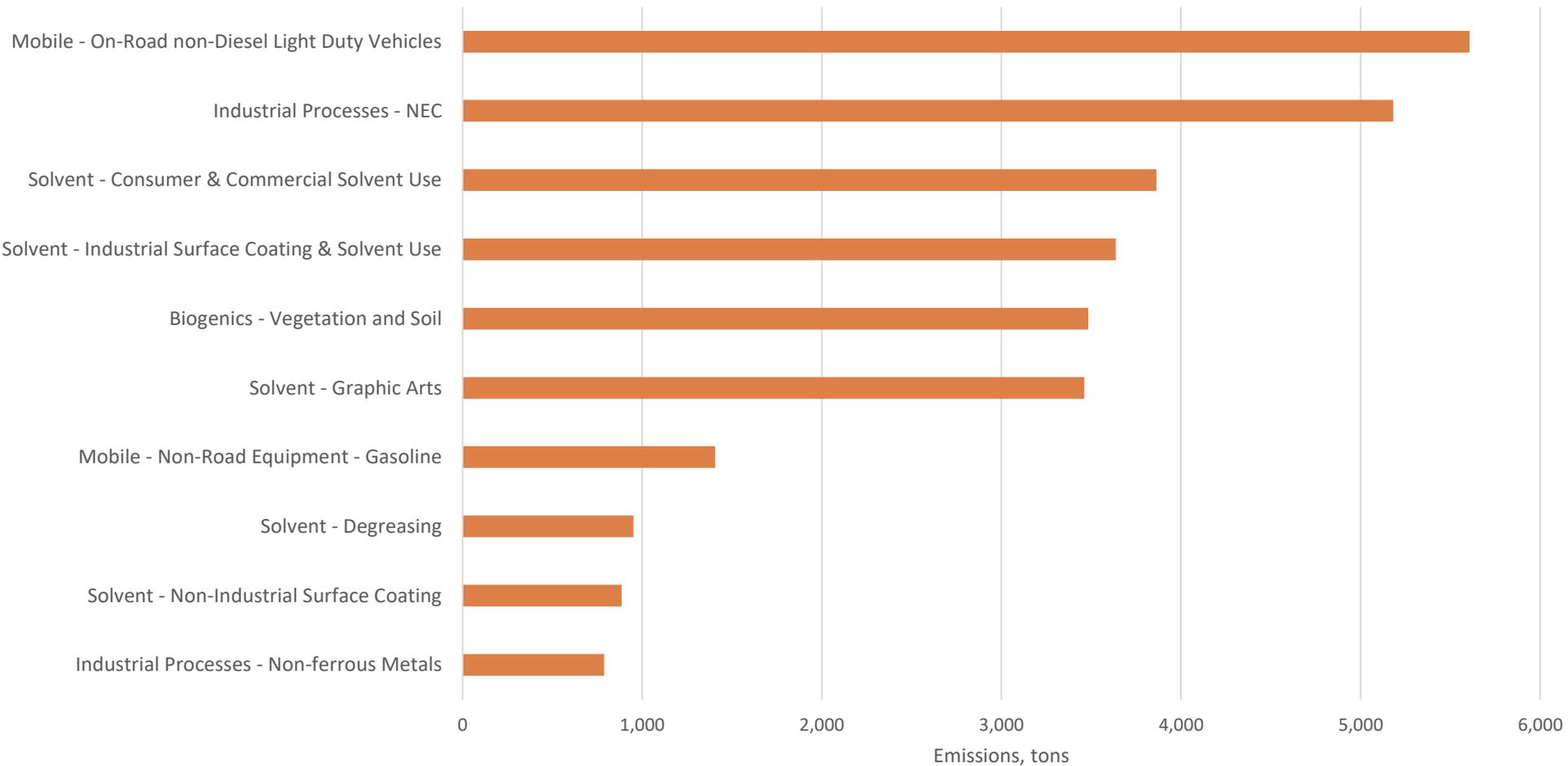
# Emissions by Category

Jefferson County



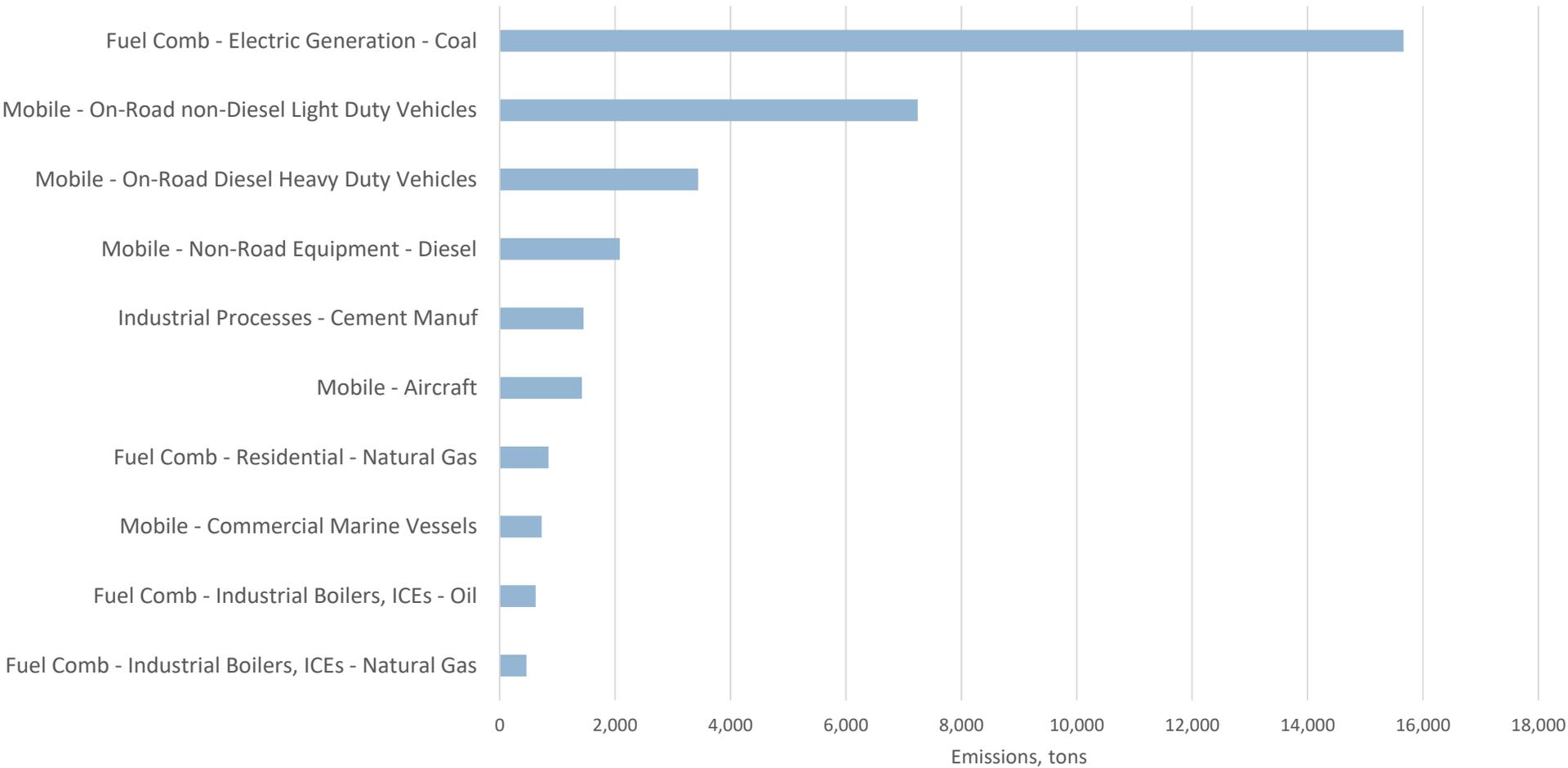
# Emissions by Sector

## Volatile Organic Compounds – Jefferson County top 10



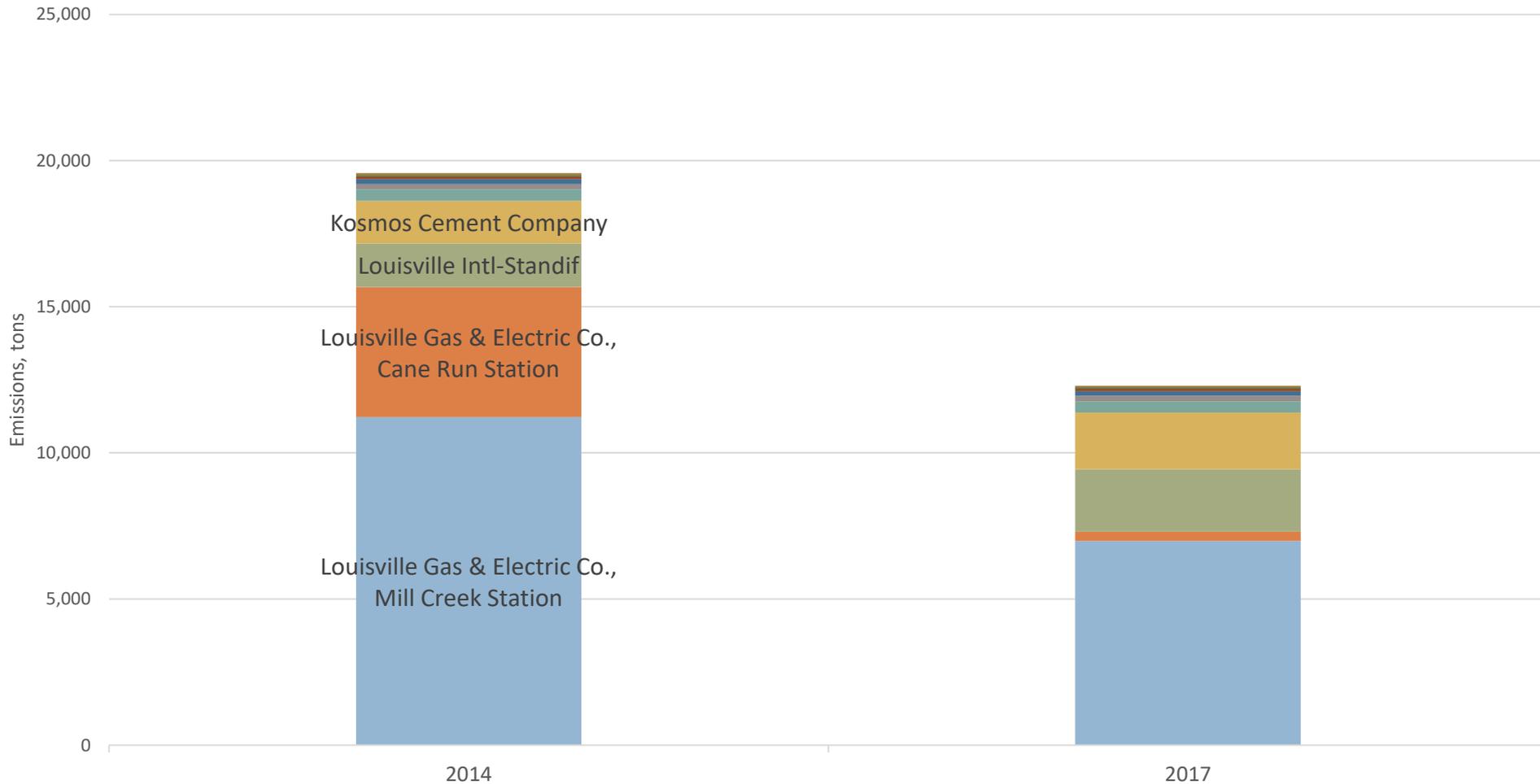
# Emissions by Sector

Nitrogen Oxides – Jefferson County top 10



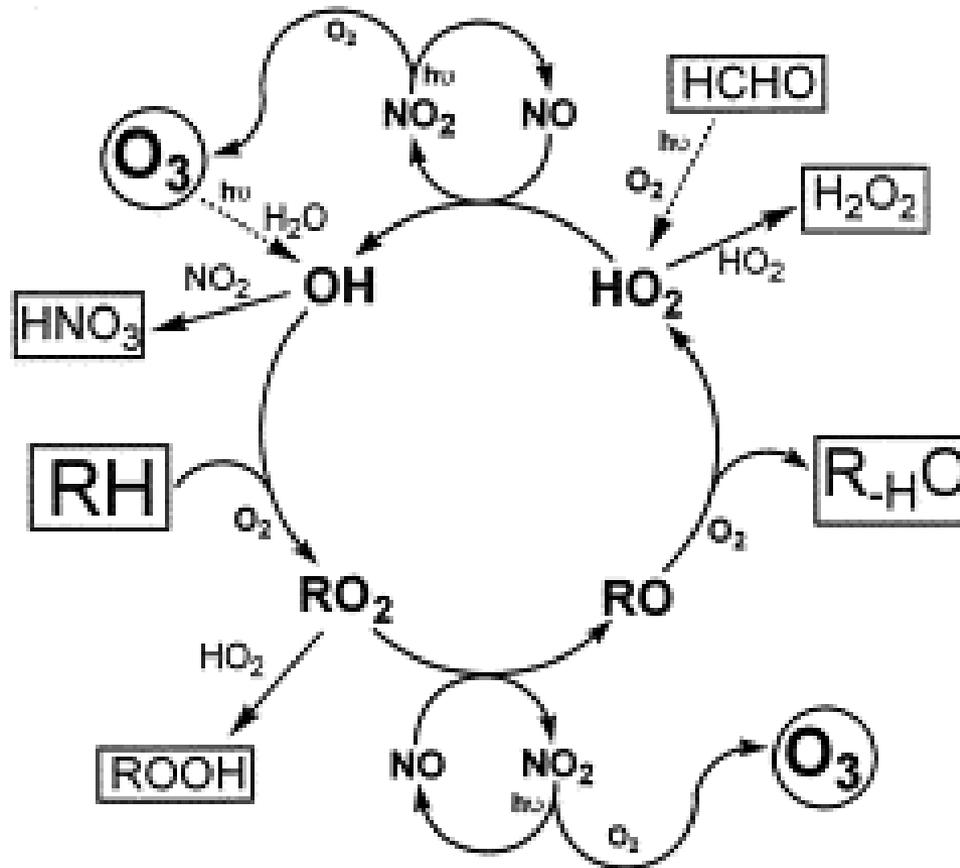
# Point Source Emissions by Facility

Nitrogen Oxides - 2014 v 2017, Jefferson County

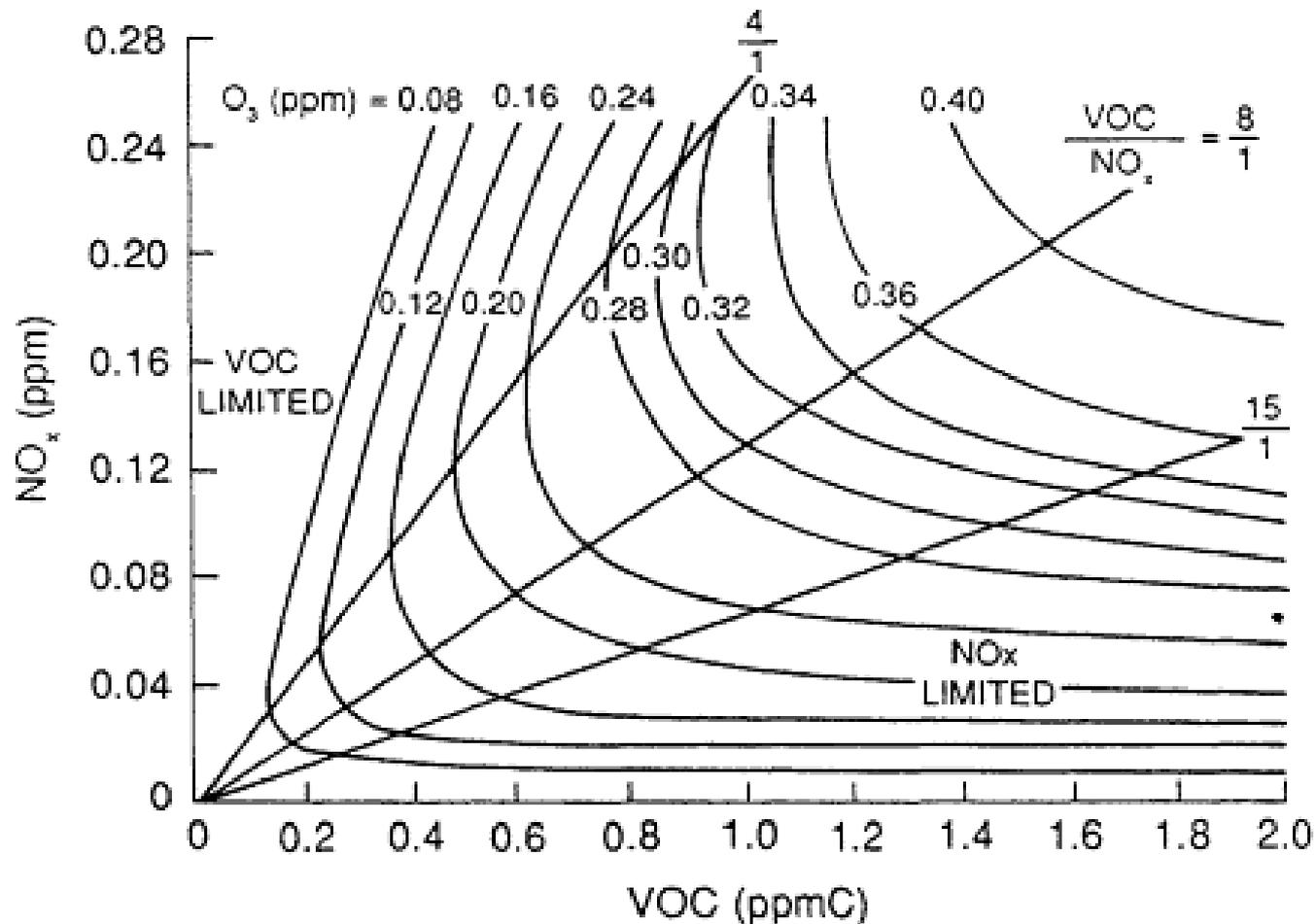


# Precursor Sensitivity

# A series of complicated non-linear reactions



# Which vary depending on the ratio of $\text{NO}_x$ and VOCs in the atmosphere

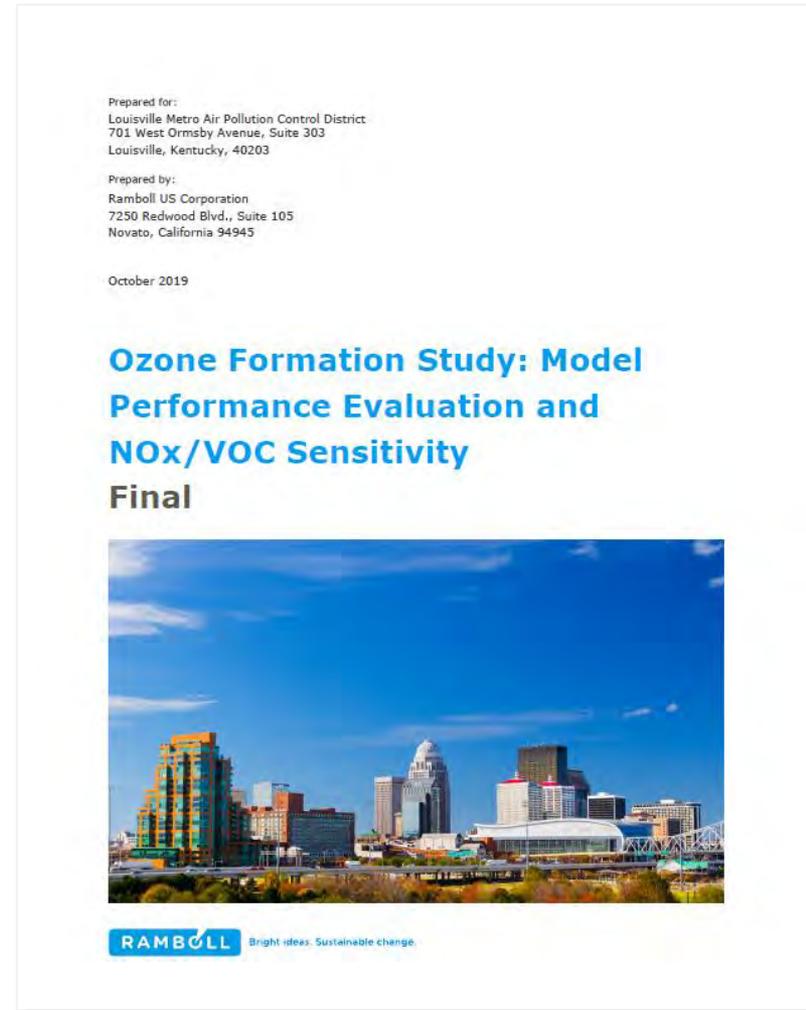


# Simple View



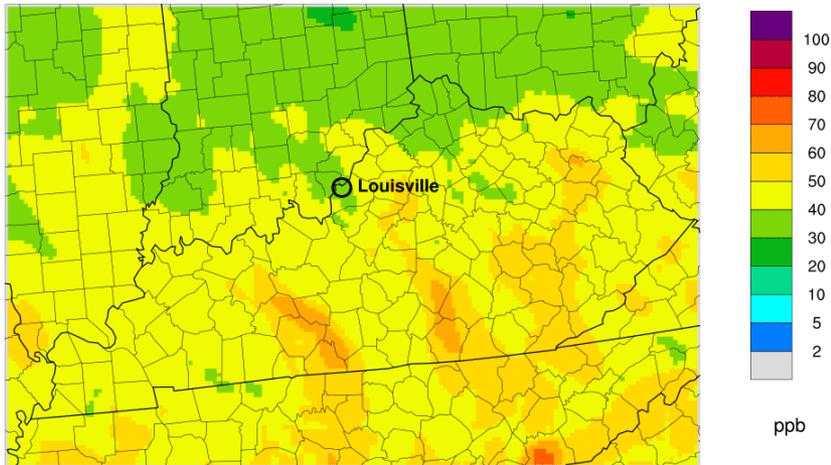
# What is the Ozone Formation Study?

- A modeling approach to help APCD determine if elevated ozone in the Louisville Non-Attainment Area is NOX-limited or VOC-limited



# Modeling

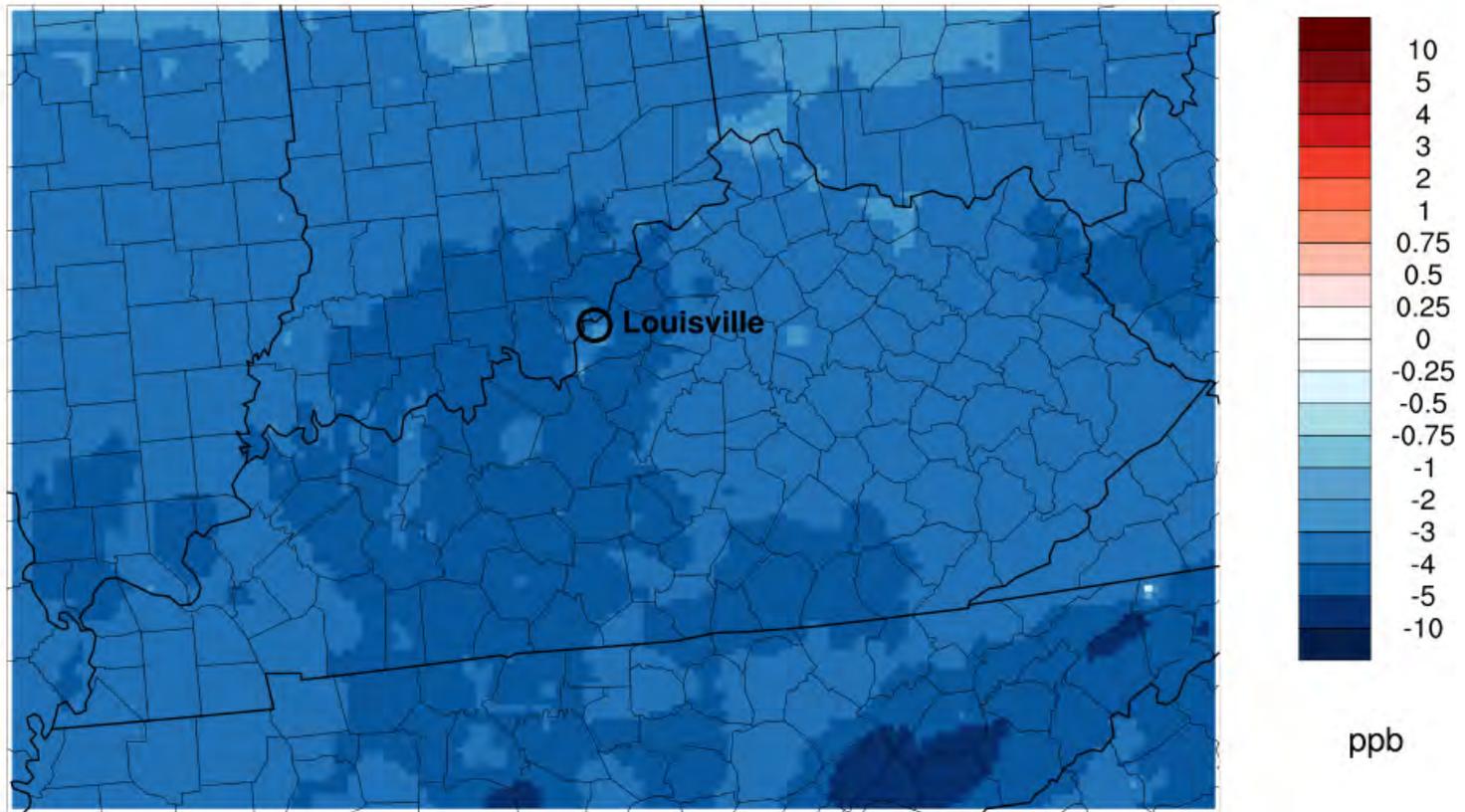
Ozone 2016-06-29 00:00 UTC



- Hourly modeling on 4-km grid
- Base Case
- 25% NO<sub>x</sub> Reduction
- 25% VOC Reduction

# NO<sub>x</sub> Sensitivity

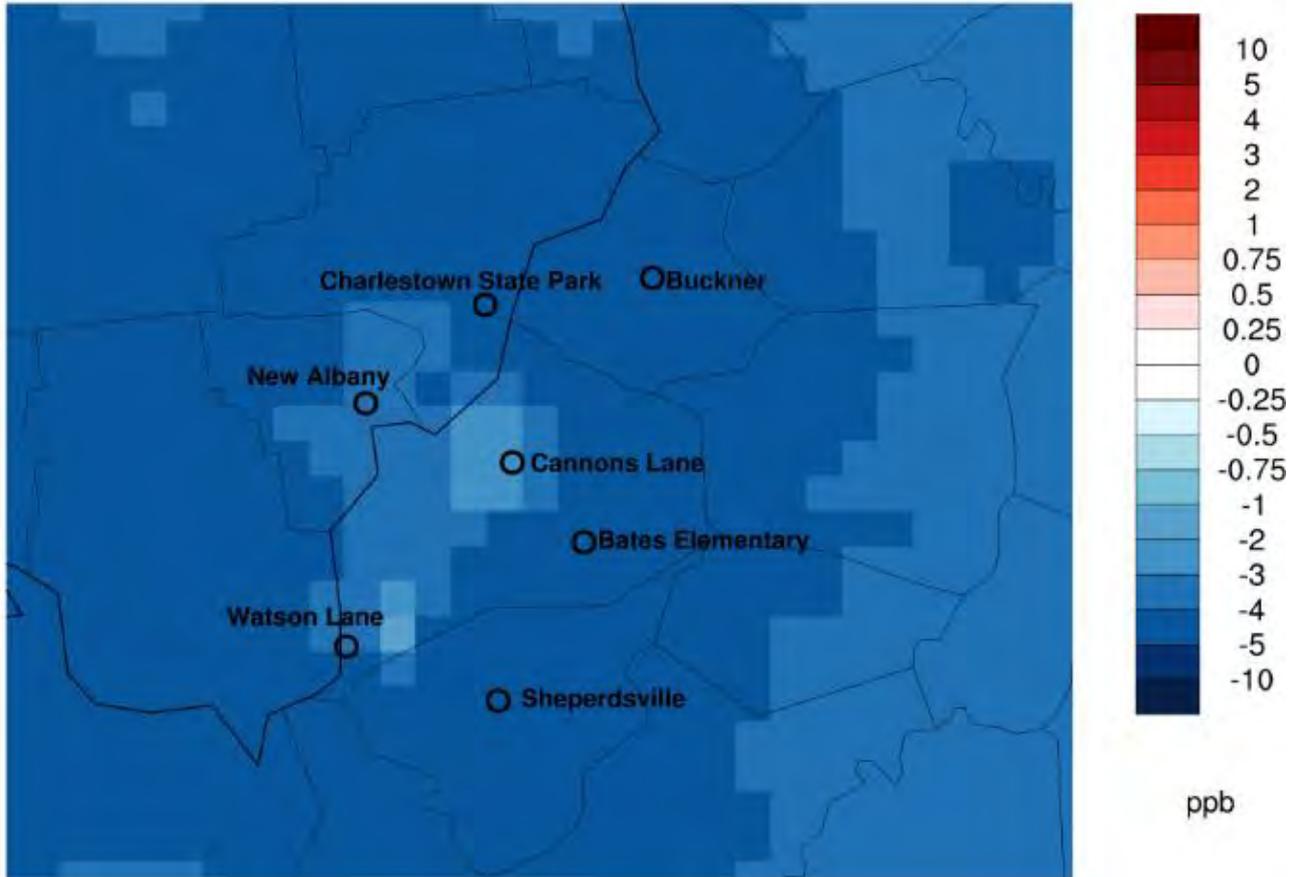
Average MD8A Ozone Difference for Top 10 Highest Observed MD8A Days



min(127,7) = -6.2 ppb

# NO<sub>x</sub> Sensitivity

Average MD8A Ozone Difference for Top 10 Highest Observed MD8A Days



# VOC Sensitivity

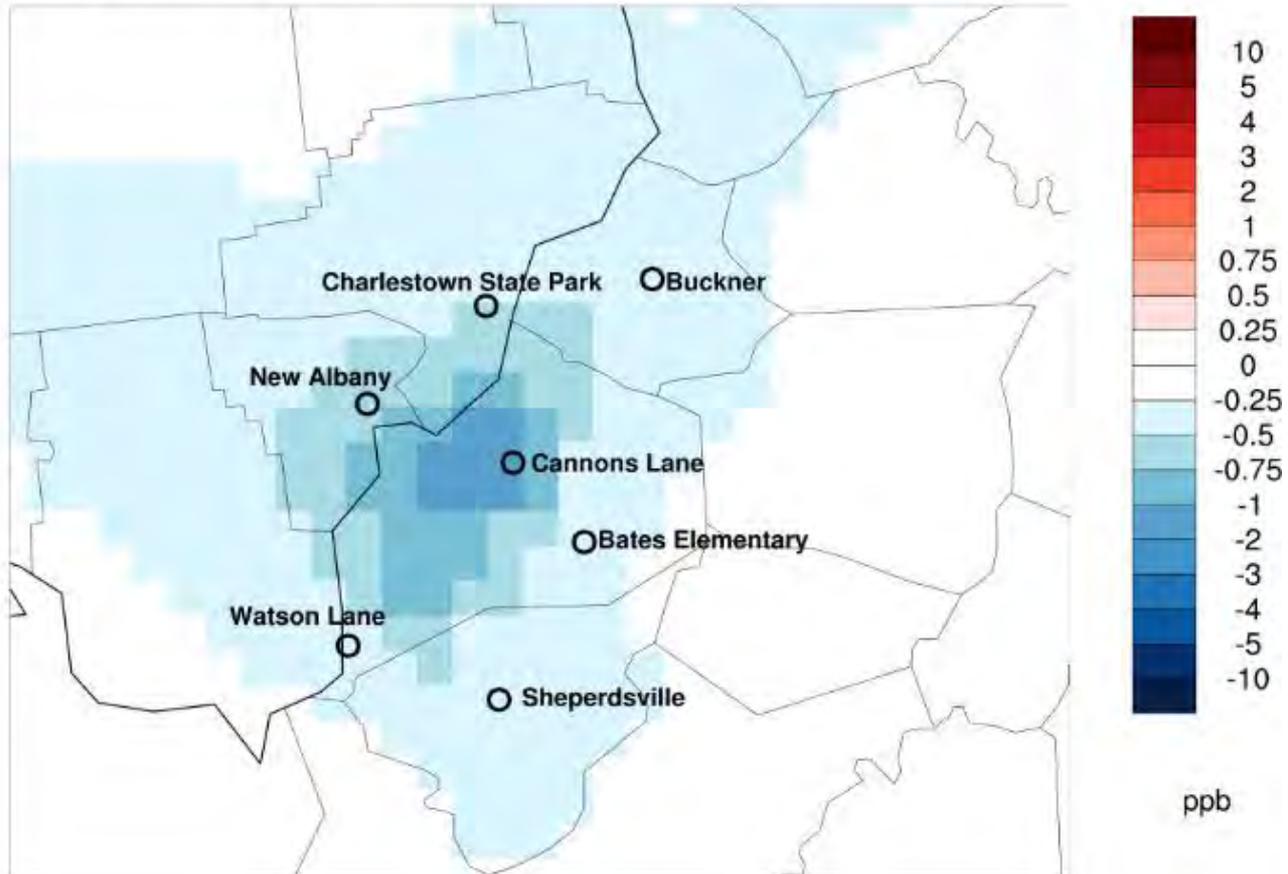
Average MD8A Ozone Difference for Top 10 Highest Observed MD8A Days



min(83,69) = -1.3 ppb

# VOC Sensitivity

Average MD8A Ozone Difference for Top 10 Highest Observed MD8A Days



# SIP Requirements

# Clean Air Act §101

## (a) Findings

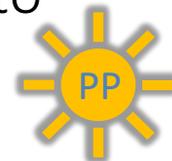
The Congress finds—

- (1) that the predominant part of the Nation's population is located in its rapidly expanding metropolitan and other urban areas, which generally cross the boundary lines of local jurisdictions and often extend into two or more States;
- (2) that the growth in the amount and complexity of air pollution brought about by urbanization, industrial development, and the increasing use of motor vehicles, has resulted in mounting dangers to the public health and welfare, including injury to agricultural crops and livestock, damage to and the deterioration of property, and hazards to air and ground transportation;
- (3) that air pollution prevention (that is, the reduction or elimination, through any measures, of the amount of pollutants produced or created at the source) and air pollution control at its source is the primary responsibility of States and local governments; and**
- (4) that Federal financial assistance and leadership is essential for the development of cooperative Federal, State, regional, and local programs to prevent and control air pollution.



# State Implementation Plan (SIP)

- Required by [Clean Air Act §110](#) to be adopted by states to implement NAAQS “after reasonable notice and public hearings”
  - “Infrastructure” SIP for whole state
  - Nonattainment SIPs for nonattainment areas
  - May contain: Regulations, Source specific requirements (RACT/RACM), Mobile Vehicle Emissions Budget (MVEB), Maintenance plan(s), Board Orders, Contingency measures
- Approved or disapproved by EPA



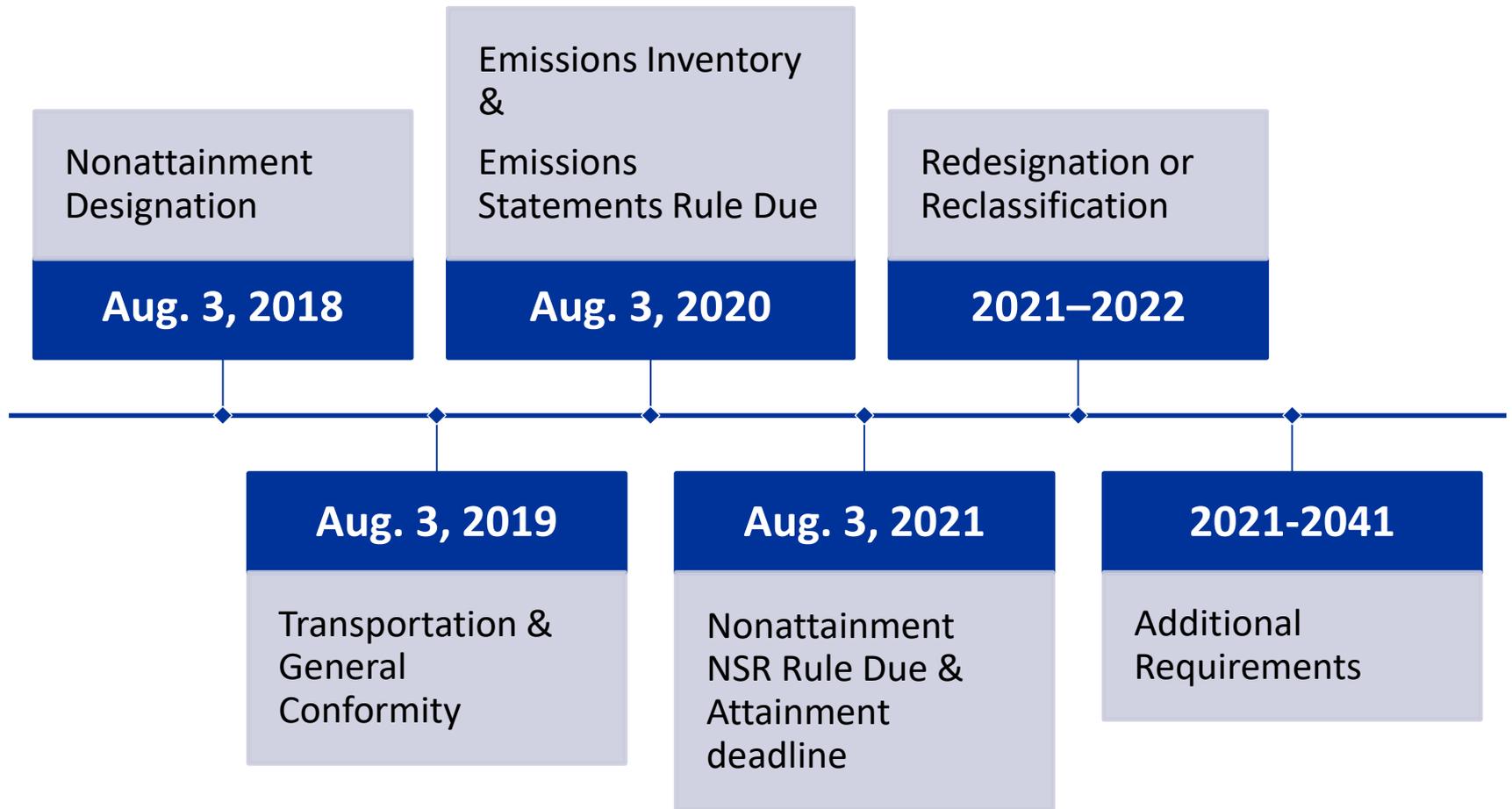
Kentucky’s SIP (including the Jefferson County portion) can be found at [40 CFR Part 52 Subpart S](#)



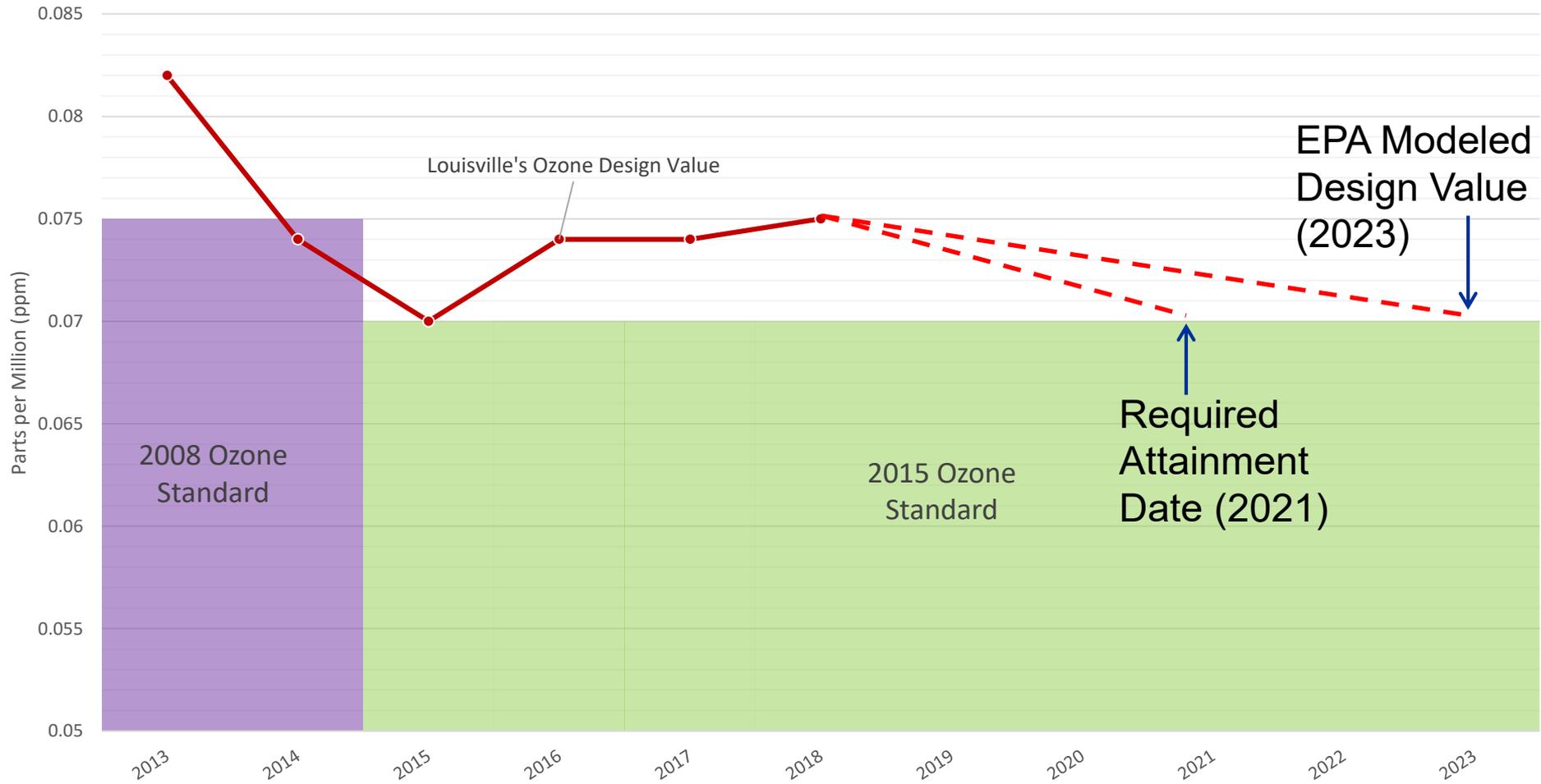
# State Implementation Plan (SIP)



# SIP Planning - Marginal



# Ozone Projections



# SIP Planning - Moderate

- Reasonable Further Progress (RFP)
- Reasonably Available Control Technology (RACT)
- Motor Vehicle Inspection & Maintenance (I&M – i.e., VET)
- NSR offset requirement increases 50% (1.15 to 1)

# Discussion and Questions

- All Attendees

# Meeting Wrap-Up

- Dr. Geoffrey Cobourn, MPSG  
Co-chair

# Thank you!



Louisville Metro  
Air Pollution  
Control District

701 W. Ormsby Ave.  
Ste. 303

Louisville, KY 40203  
(502) 574-6000

[www.louisvilleky.gov/APCD](http://www.louisvilleky.gov/APCD)