



Sky over Lake County, Ohio

*June 15, 2010*

# Air Quality Challenges

(Or “They Want Us To Do *What?*”)

Amy M. Wainright, Esq., *Air Quality Planner*  
*Northeast Ohio Areawide Coordinating Agency (NOACA)*

# Overview



Lake Erie

- Ohio Air Quality Then & Now
- National Challenges
  - Ozone
  - Fine Particles
  - Greenhouse Gases
- Processes & Tools for Finding Solutions
- Strategies to Consider

# What Is NOACA?

Metropolitan Planning Organization (MPO) and Areawide Agency for five counties:

\* Cuyahoga \* Geauga \* Lake \* Lorain \* Medina



Aerial photo –  
NOACA region

# Ohio Air Quality Then & Now

## Youngstown Sheet & Tube – 1920's



## Cuyahoga River 1965 – Site of the 1969 Fire



Cuyahoga River 1969 – One of 5 recorded fires  
(USEPA is formed in 1970)



# Historical Review

Courtesy of Ohio EPA - Division of Air Pollution Control

- Ohio air quality in 1970's was some of the worst in nation.
- 1970 – Federal Clean Air Act enacted.
- 1975 - 44 air pollution alerts in Ohio:  
32 in Steubenville alone



Painesville, Ohio 1961

## Sources:

Steel mills, coal-fired power plants, cars, trucks, ships, trains, off-road equipment, plus air pollution transport and temperature inversions.

# Steubenville OH Air Alert 1972

Fine Particles at 700 micrograms per cubic meter



# Cuyahoga River Today



# Ohio Air Quality Improving Since 1972 (Source: Ohio EPA)

**95% Decrease in  
Lead in air**

**90% Decrease in  
SO<sub>2</sub> in air**

**70% Decrease in  
CO<sub>2</sub> in air**

**74% Reduction in  
Particulates**

**51% Reduction in  
VOCs in air**

**27% Decrease in  
Ozone in air**

**22% Decrease in  
NO<sub>x</sub> in air**

**\$5 Billion spent on  
control equipment**

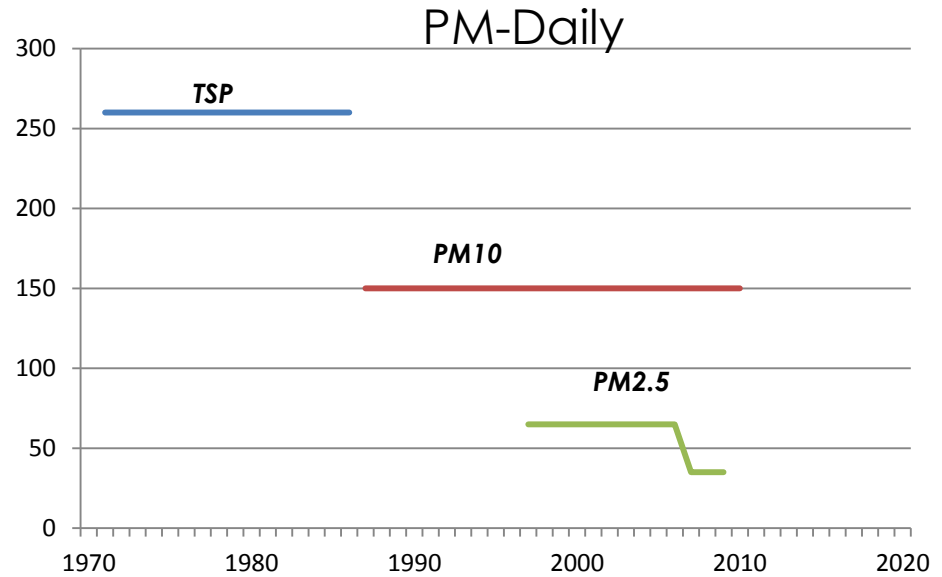
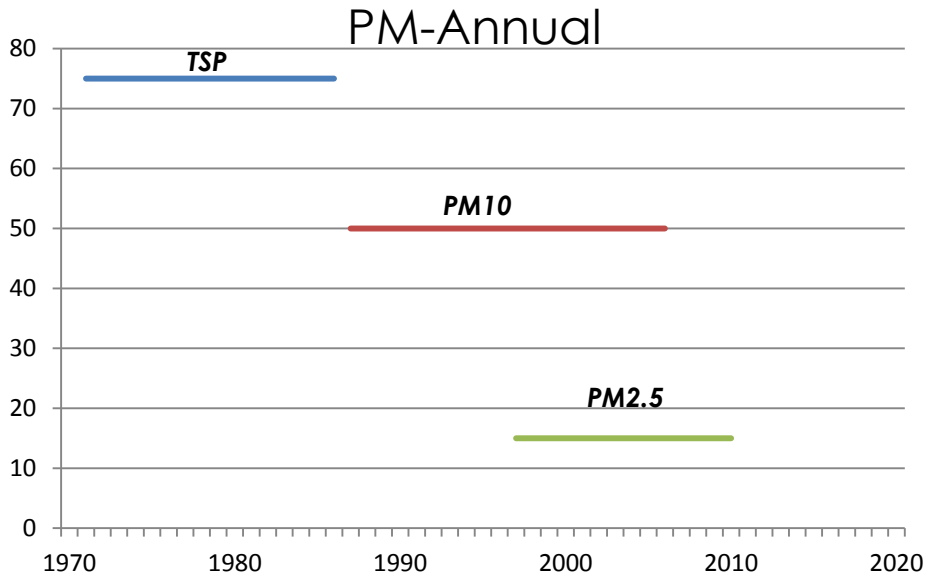
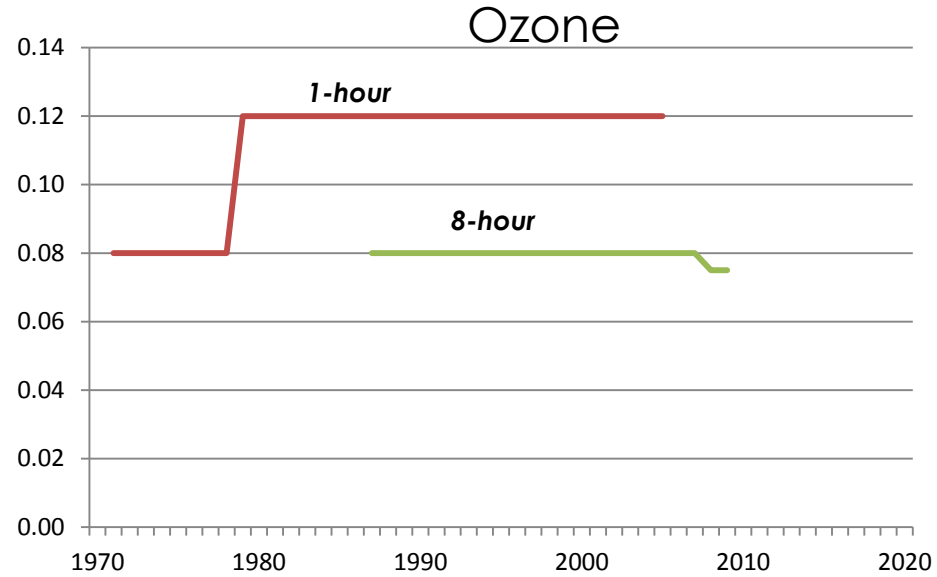
So, no, it's not like that...



# History of NAAQS: Ozone and Particulate Matter

Lake Michigan Air Directors Consortium  
(LADCO) May 2010

National Ambient Air Quality Standards  
(NAAQS)  
Ozone in parts per million (ppm)  
Total Suspended Particulates (TSP) and  
PM in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ )



# Challenge #1 – Ground-Level Ozone



Geauga County, Ohio

- $O_3$
- Made of volatile organic compounds (VOCs) and oxides of nitrogen ( $NO_x$ ) in hot sunlight.
  - Summer only.
- Detectable by smell on high smog days.
- Sources: Industry, motor vehicles, and trees. (Ronald Reagan was right, to an extent).

# Sources of Ozone Precursors

VOCs are commonly emitted by:

- Cars & trucks
- Gasoline stations
- Paints & coatings
- Solvents
- Industrial sources
- Lawn mowing equipment

NO<sub>x</sub> is commonly emitted by:

- Power plants
- Large industrial sources with boilers
- Cars & trucks
- Ships
- Trains
- Diesel engines

# The Ozone Challenge

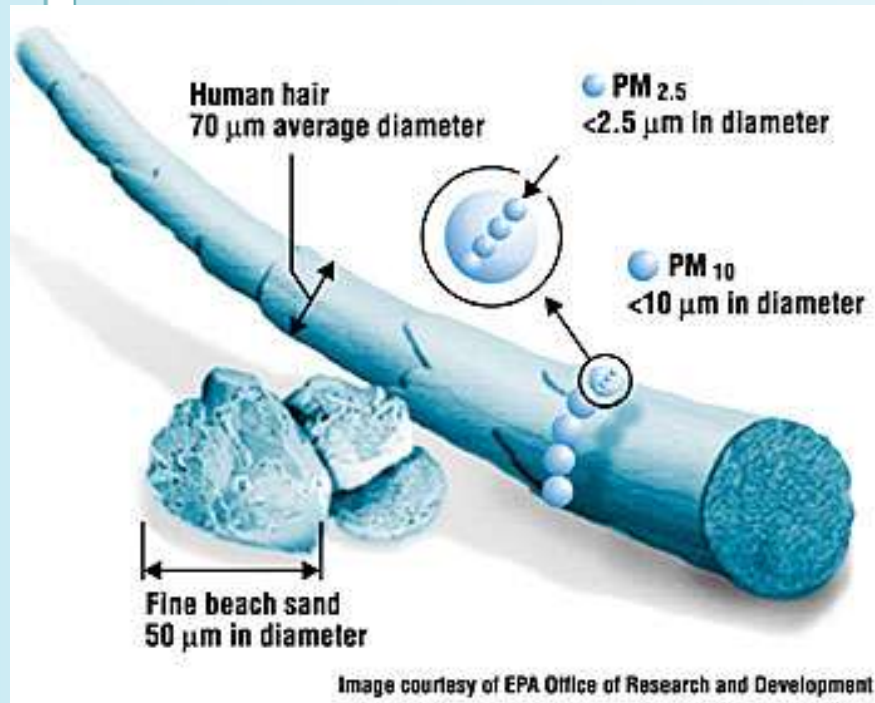
- Current NAAQS is 75 ppb.
- New NAAQS of between 60 – 70 ppb will be announced August 2010.
- This range would put **all monitored counties in Ohio and most monitored counties across the United States** into nonattainment.
- USEPA projects that many would remain in nonattainment, even by 2020.

## Can We Make It?

- Some examples of “natural background” ozone levels:
  - Glacier National Park in Montana = 55 ppb
  - Craters of the Moon National Monument in Idaho = 64 ppb
- One USEPA Policy-Relevant Background (PRB) site for setting standards is:
  - Trinidad Head, Northern California = 50 ppb



# Challenge #2 – Fine Particulate Matter (PM<sub>2.5</sub>)



- PM<sub>2.5</sub> is particulate matter smaller than 2.5 micrometers in diameter – less than one-tenth the width of a human hair.
- PM<sub>2.5</sub> has been found to be a contributor to lung disease, heart disease, and premature death.

# Particulate Matter

- $PM_{10}$  – Coarse particulate matter.
  - Components: Soot (carbon), sand, dirt, road salt, etc.
  - Sources: Industry, motor vehicles, unpaved roads, construction, and woodburning.
- $PM_{2.5}$  – Fine particulate matter.
  - Components: Water, ammonium sulfates, ammonium nitrates, (ammonia,  $SO_2$ ,  $NO_x$ ), carbon, dirt, dust, road salt, etc.
  - Sources: Industry, motor vehicles, agriculture, woodburning, and water vapor.



Cleveland, Ohio

$PM_{2.5}$  forms year-round.

Visible as brown haze.

Directly emitted (primary formation) and also formed in the atmosphere (secondary formation).

**Challenges: Strict NAAQS Nationwide; plus Regional Haze limits near National Parks & Wilderness Areas**

# Challenge #3 – Greenhouse Gases & Climate Change

- USEPA in 2009 made a finding that six greenhouse gases (GHG) threaten public health, and that motor vehicles contribute to GHG emissions.
- Includes:
  - CO<sub>2</sub> (carbon dioxide) *(from combustion)*
  - CH<sub>4</sub> (methane) *(from decomposition)*
  - N<sub>2</sub>O (nitrous oxide) *(from combustion)*
  - HFC (hydrofluorocarbons) *(from air conditioning) (replaced CFCs)*
  - PFC (perfluorocarbons) *(from aluminum production)*
  - SF<sub>6</sub> (sulfur hexafluoride) *(from circuit breakers; window filling)*
- *(Note: Ozone is also a GHG.)*



# Challenges: How much can transportation planning reduce GHG? How will GHG affect ozone?

USEPA - "Our Nation's Air: Status and Trends through 2008" (Report available at [www.epa.gov](http://www.epa.gov))

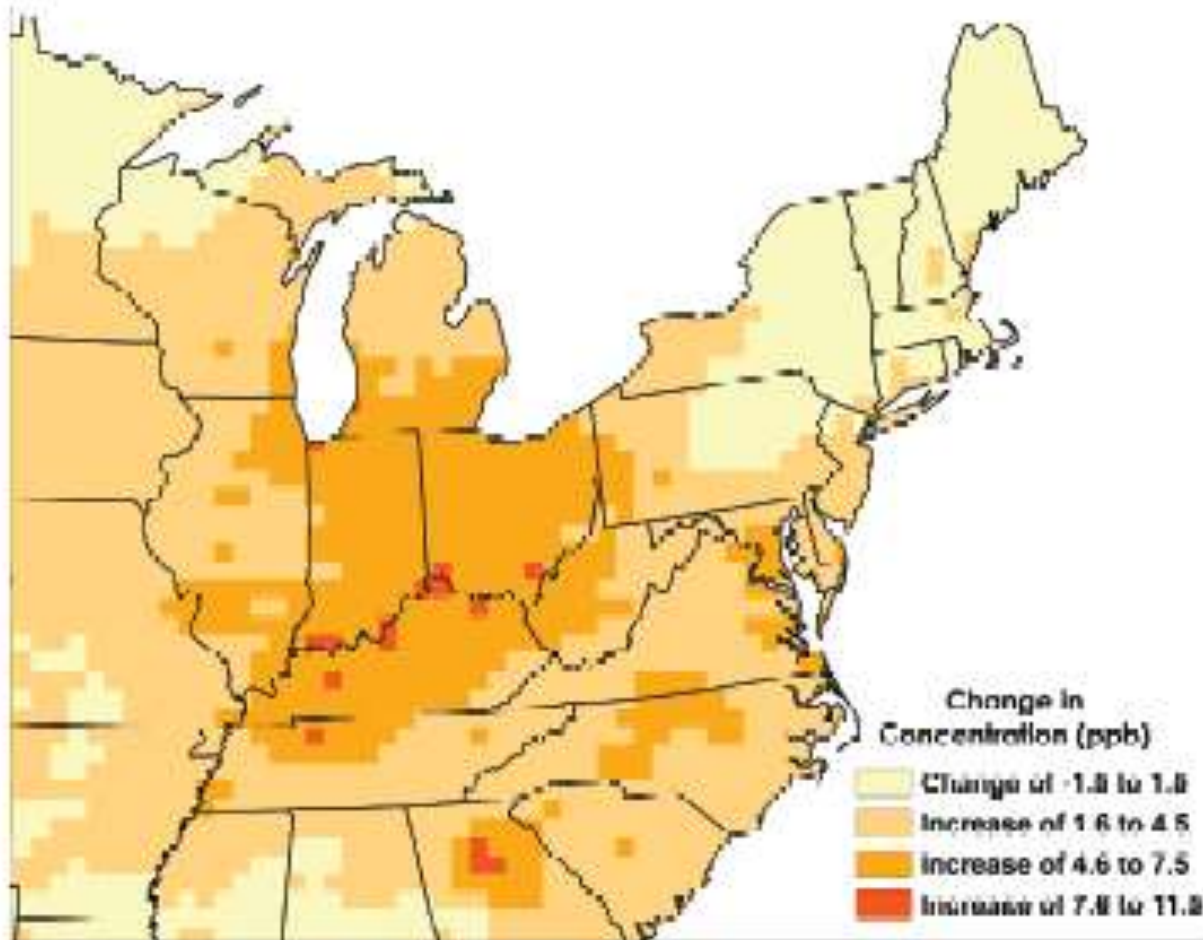
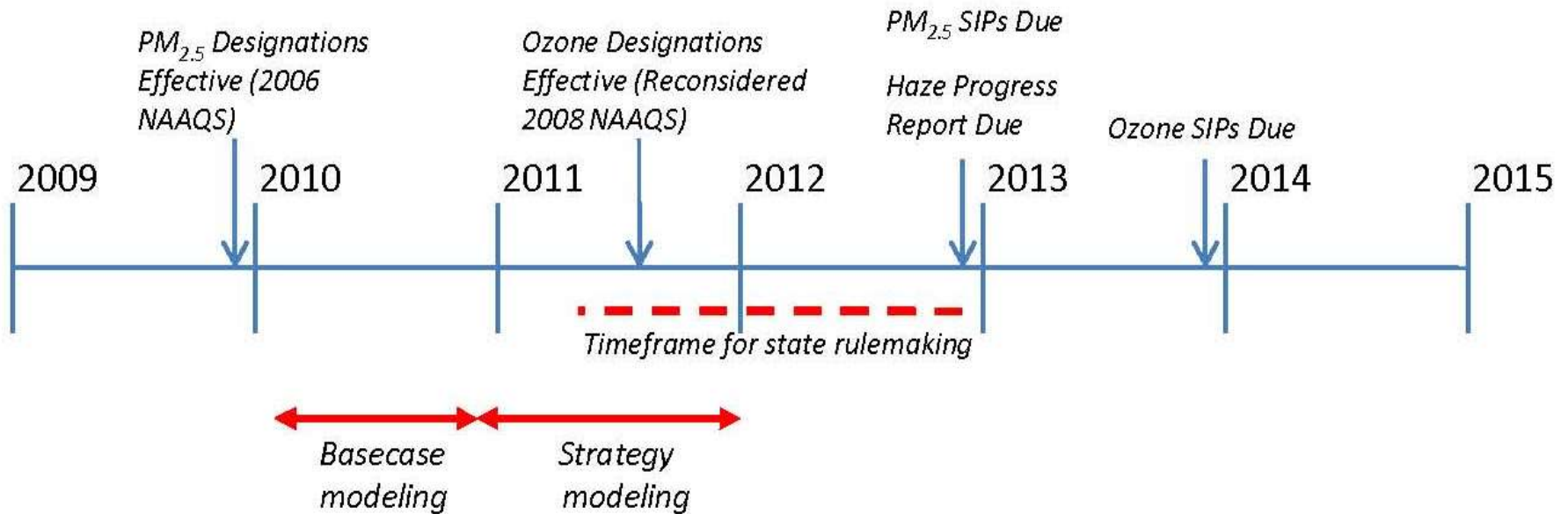


Figure 35. Increases in average summertime ozone concentrations in the eastern U.S., due to climate change, are predicted for 2050. (Source: Figure 33 from EPA Assessment, 2009. 2050s-minus-present differences in simulated summer mean maximum daily average 8-hour ozone concentrations; reproduced from Figure 2 in Hogrefe et al., 2004.)

# Processes & Tools for Finding Solutions

- Know the timeframe.
- Create baseline inventories.
  - What are the local sources?
  - How much is transported air pollution?
- Coordinate with other regions to obtain comprehensive air quality modeling projections.
- Investigate emissions reduction strategies.
  - What would work locally? Statewide?
- Assess which strategies have value.
  - Invite public input.
  - Talk with private sector.
- Make recommendations to state EPA's.

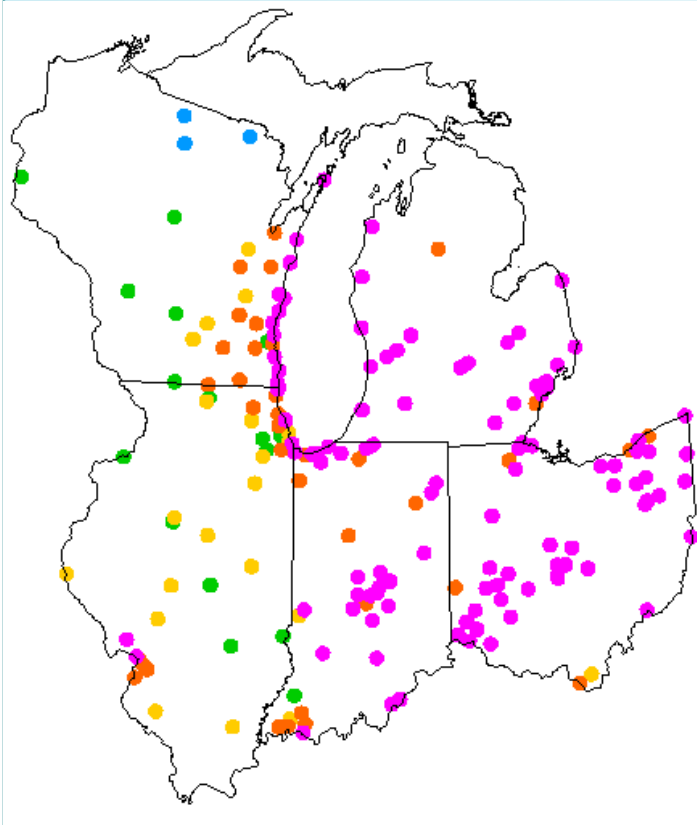
# Sample Tool: Schedule for Upcoming NAAQS



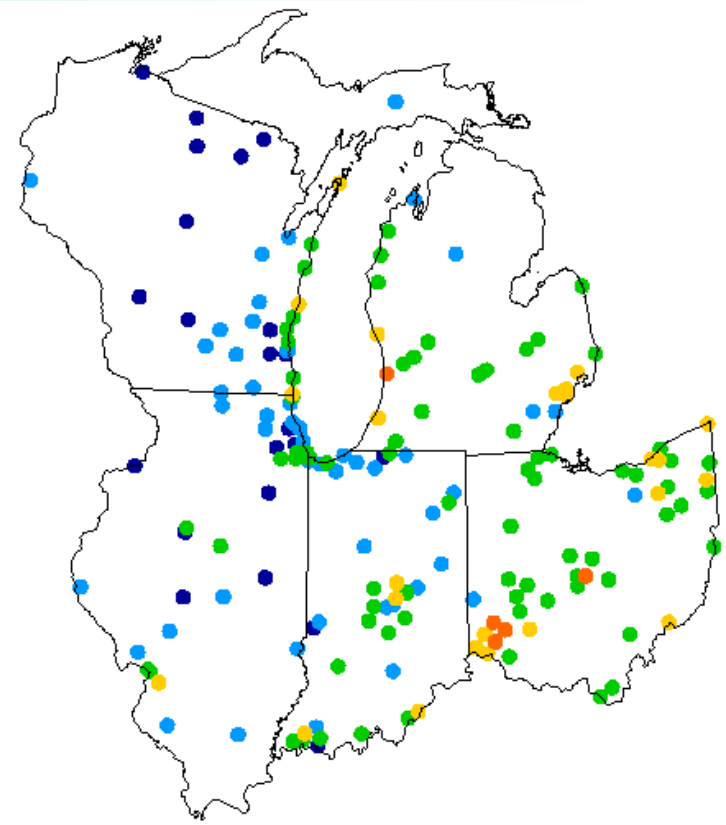
# Sample Tool: Current Monitor Values

Midwestern Design Values: 8-Hour Ozone

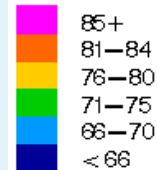
2001-2003



2007-2009



DV, in ppb

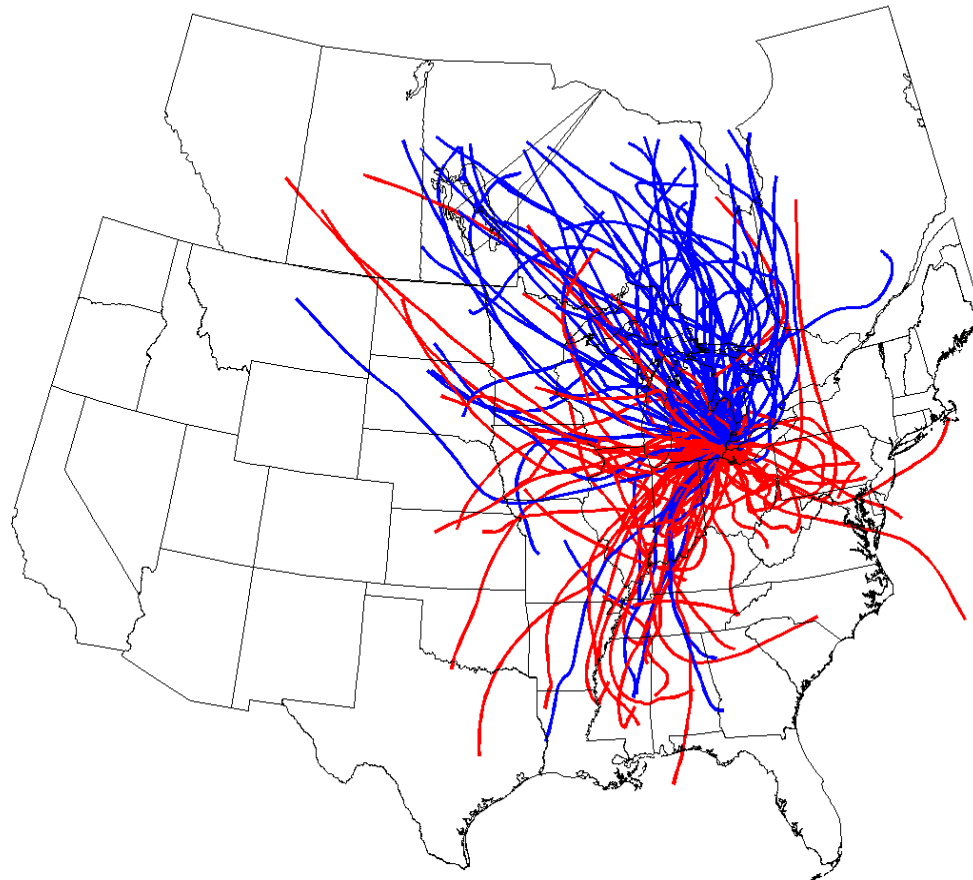


Lake Michigan Air Directors Consortium (LADCO) May 2010

# Sample Tool: Windrose to Determine Where Transported Pollution Comes From

48-Hour Backward Trajectories for Detroit— —Allen Park

Stat Height= 200 m. Best Days are Blue, Worst Days are Red



# Sample Tool: Analysis of Local Emissions vs. Other

“Urban Excess” or “How Much is Ours?”

Urban (local) in dark blue; rural (outside the region) in light blue  
LADCO – “PM<sub>2.5</sub> in Urban Areas in the Upper Midwest” (2007)

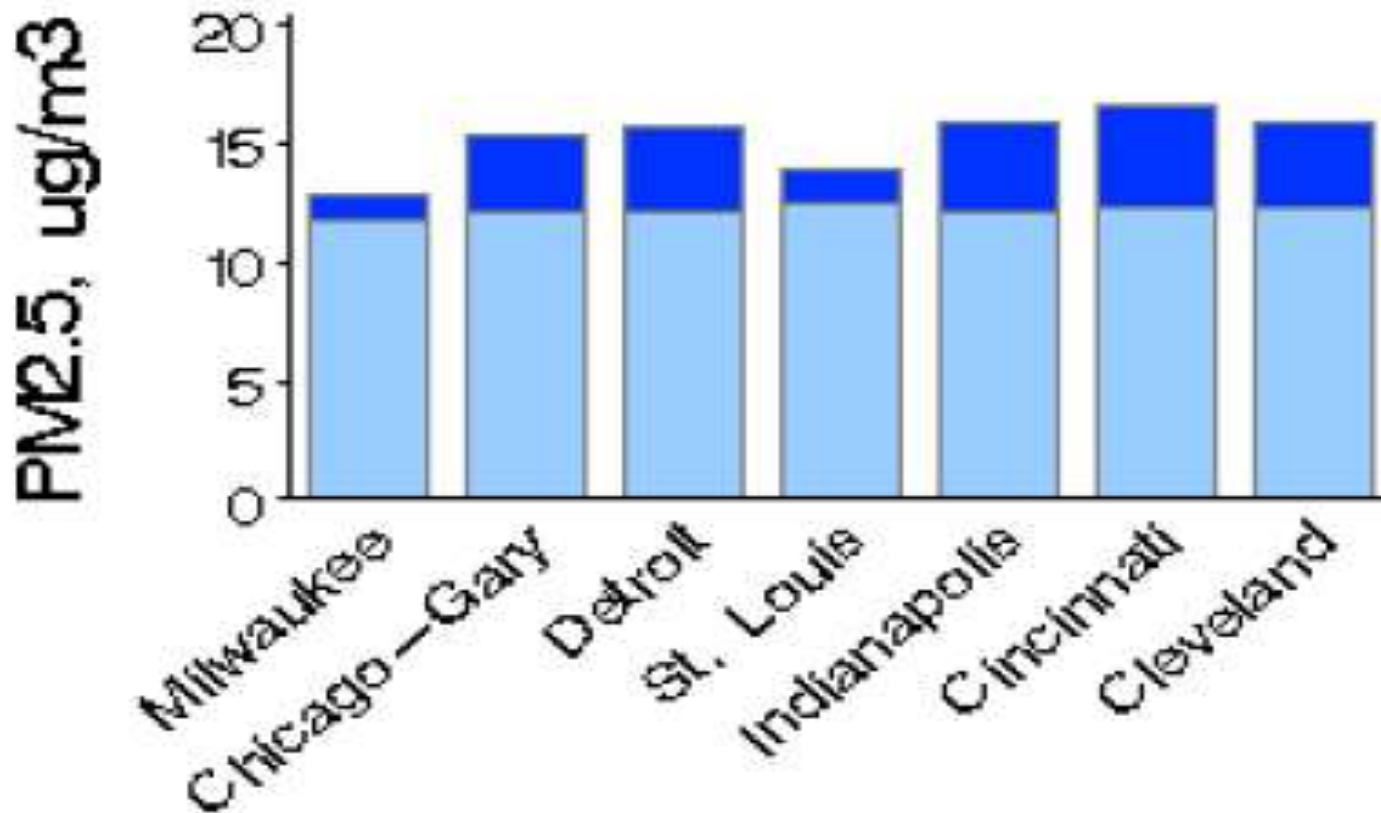
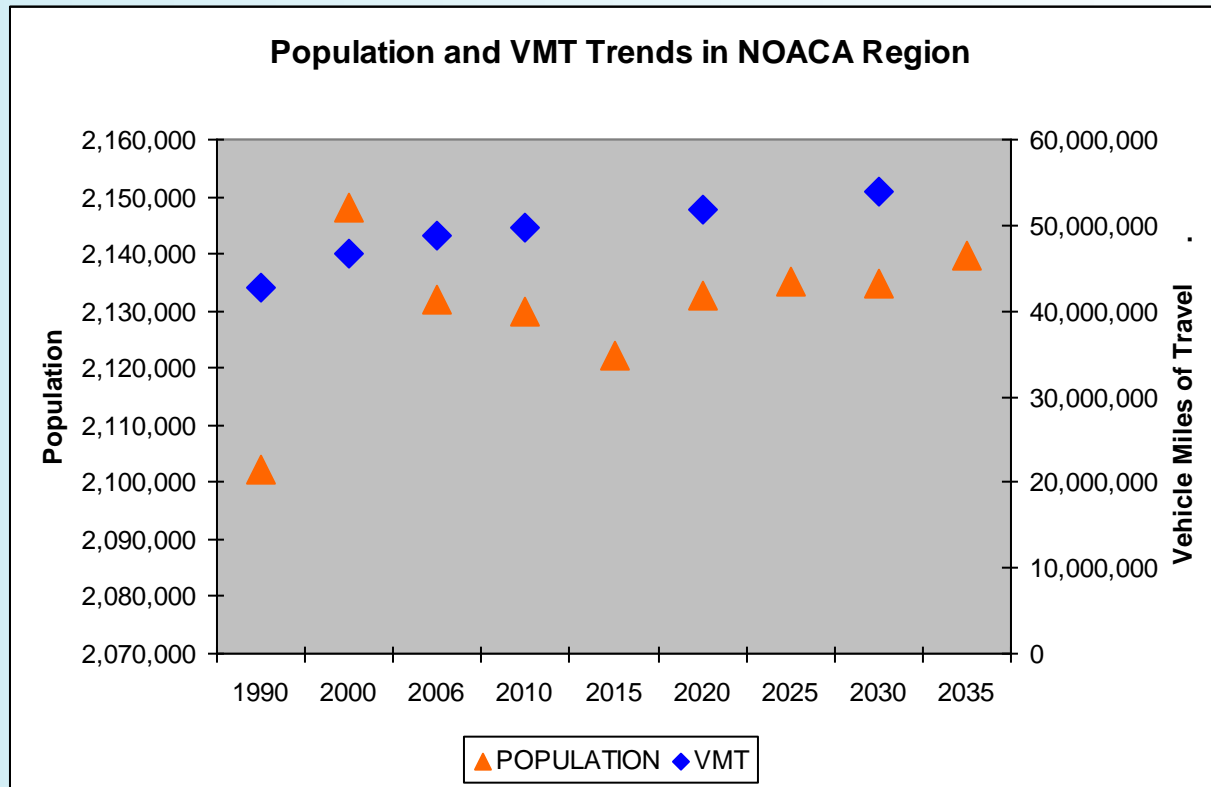


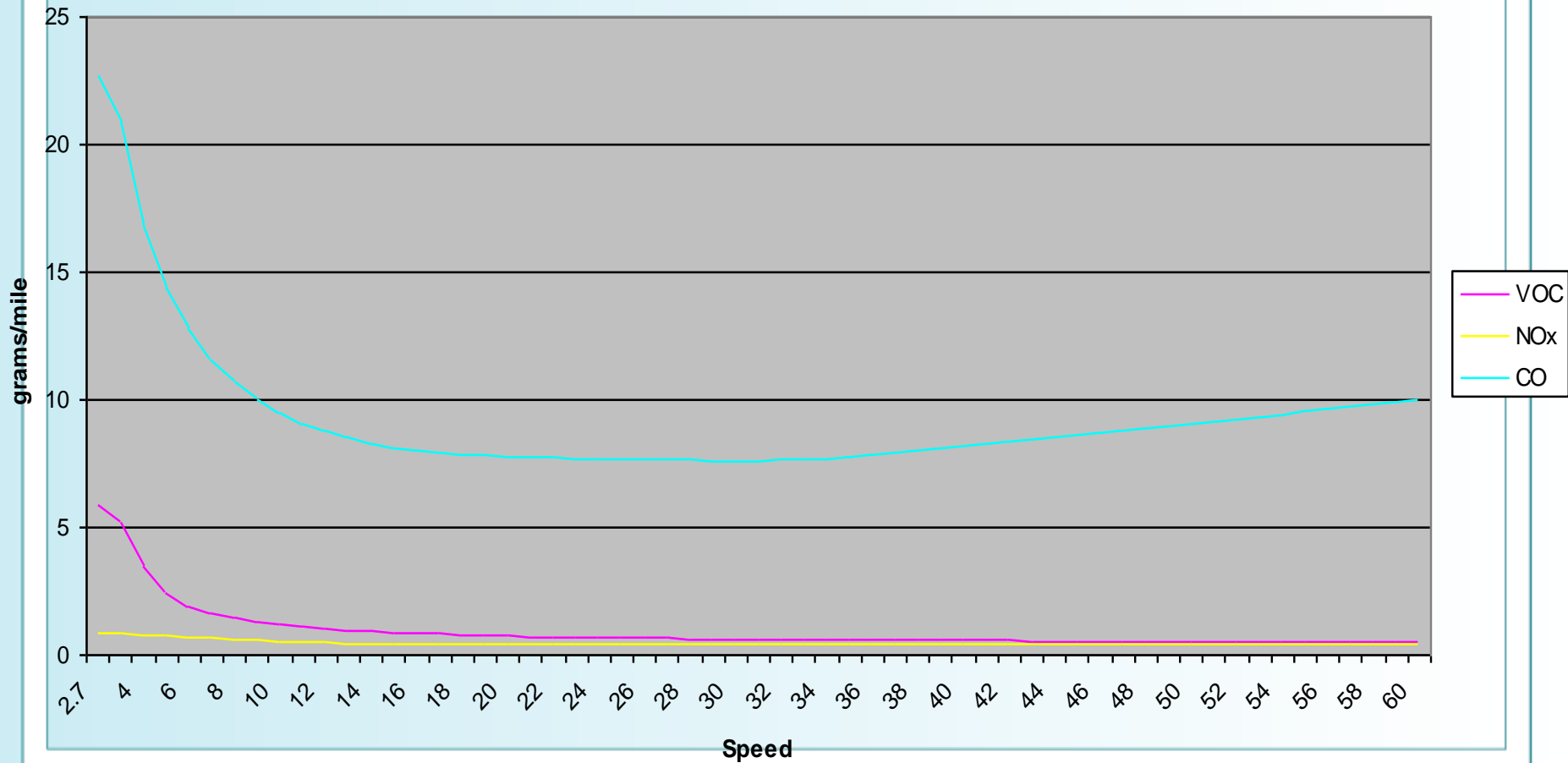
Figure 6. Urban v. Rural PM<sub>2.5</sub> Contributions

# Sample Tool: Population & VMT Projections

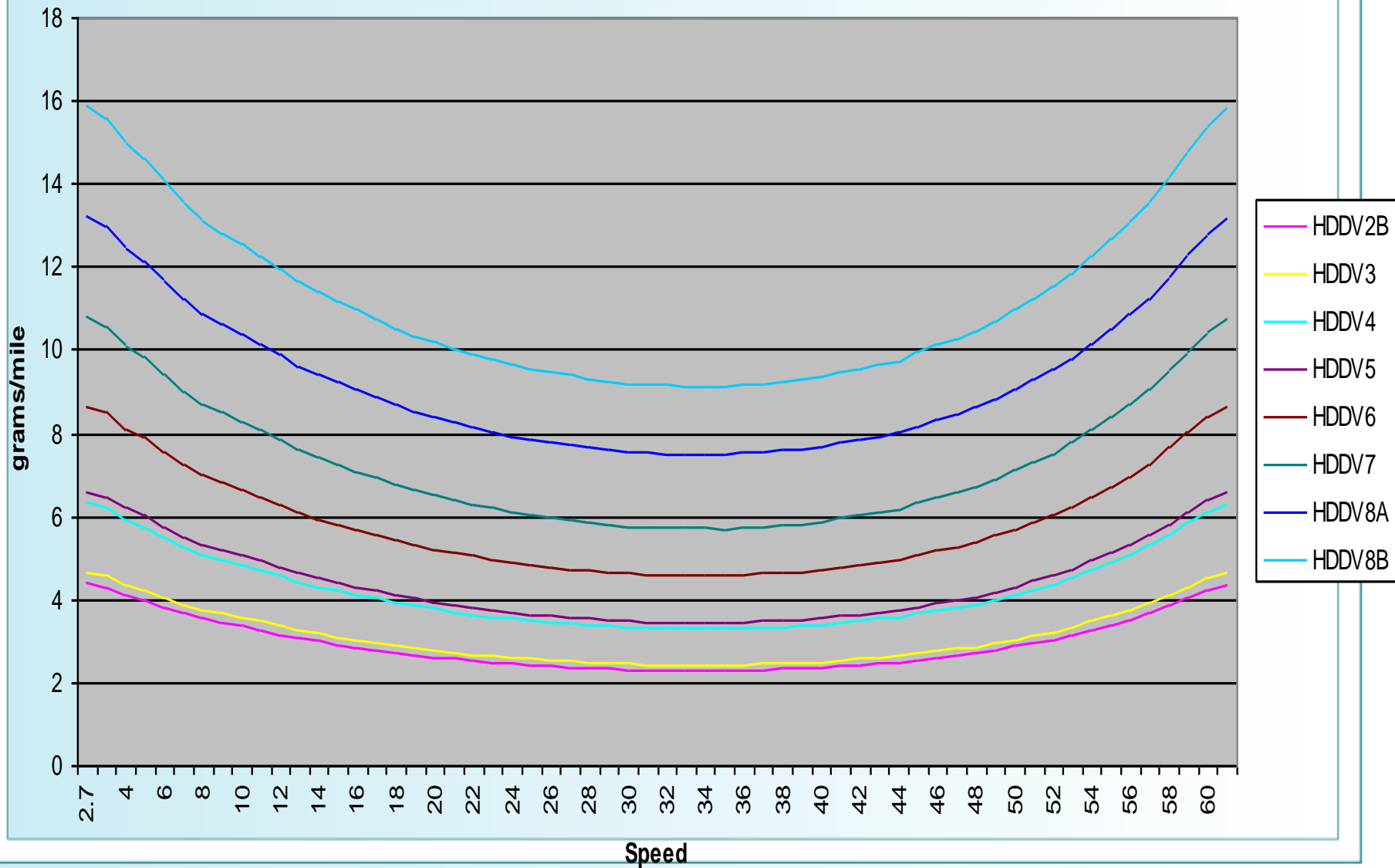


# Sample Tool: MOBILE6.2 Run of Mobile Source Emissions at Various Speeds

Light Duty Gasoline Vehicles Emission Spd Curves



# NOX from HDDVs



# Strategies for Consideration

- 1.) Low-Reid Vapor Pressure (RVP) gasoline. (improves ozone)
- 2.) Alternative Fuels and Electric Vehicles for Public and Private Fleets
  - a. Ethanol (E85) (improves  $PM_{2.5}$ , may worsen ozone)
  - b. Biodiesel
  - c. Natural Gas
  - d. Propane
  - e. Electric Vehicles, both plug-in and hybrid
- 3.) Stricter enforcement of highway speed limits.
- 4.) Truck stop / rest area electrification – facilities to “plug in.”
- 5.) Intelligent Transportation Systems (ITS).
- 6.) Congestion management / incident management.

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AW, GEEZ, NOW  
WE'RE MERGING DOWN  
TO ONE PLAIN...

# Strategies for Consideration, cont.

- 7.) Voluntary trip reduction programs by employers to promote:  
transit, carpooling, compressed work weeks, telecommuting,  
conference calls and other "virtual meetings," trip combining,  
bicycling, and walking.
- 8.) Anti-idling policies for cars, trucks, buses, and off-road equipment at the  
state and local level:
- Statewide school bus idling regulation.
  - Idling policies for transit and other public fleets.
  - Loan programs for anti-idling equipment (auxiliary power units, cab heaters, etc.)
  - Voluntary idling program with educational outreach.
  - Mandatory local ordinances or statewide law on idling limits
    - *(E.g., City of Cleveland : 5 minutes summer, 10 minutes winter, w/ exemptions based on USEPA model ordinance).*
  - Voluntary idling reductions from switchyard and line-haul locomotives.

# Idling and Mobile Source Emissions

If every vehicle being driven in NE Ohio (approximately 500,000 cars and trucks out of 2 million registered vehicles, plus those passing through) were to eliminate 10 minutes of idling, just for one day, it would remove from the air an estimated:

- 1.466 tons of volatile organic compounds (VOCs) (for ozone)
- 0.402 tons of oxides of nitrogen (NO<sub>x</sub>) (for ozone and particulates)
- 1,500 tons of carbon dioxide (CO<sub>2</sub>) (greenhouse gas)

As well as carbon monoxide, toluene, benzene, and other hazardous pollutants.

Clean and dirty particulate air monitor filters, Ohio EPA, Lorain County, Ohio, summer 2008

(6 weeks difference)



# The Six R's of Diesel Cleanup

(Consider CMAQ Eligibility)

- *Retrofit* existing vehicles with pollution controls
- *Refuel* with cleaner fuels
- *Replace* older vehicles with clean technology vehicles
- *Reduce* idling
- *Repair/Rebuild* using engine maintenance and/or rebuilding
- *Repower* by replacing older engines with newer engines



# Strategies for Consideration, cont.

## 9. Diesel On-Road & Non-Road Vehicles

### - Public Fleets

- Mandatory best available retrofit technology (BART) for all government diesel vehicles, if funding is supplied.

### - Public and Private Fleets

- Voluntary emissions reduction programs – grants/loans for public and private vehicles, and an educational campaign.

### - Emissions performance specifications in contracts for public works projects. Could include:

- Idling time limits.
- Use of new or retrofitted diesel equipment.
- Use of alternatively fueled vehicles (electric, CNG, etc.)
- Overall emissions limits to allow flexibility for contractors – use of newer equipment compared to other work sites.

# Strategies for Consideration, cont.

10.) Bus replacement programs.

11.) Transit incentives, transit centers, Park-&-Ride lots, enhanced waiting environments, and funds for operations.

*"The heart of the green jobs revolution starts with the bus driver." Rev. Jesse Jackson, transit rally, Cleveland OH, May 22, 2010.*

12.) Traffic signal synchronizations.

13.) Roadside diesel opacity testing – “snap idle” test for PM.

14.) Ports – Review inter-modal operations, consider anti-idling limits for trucks, discuss emissions with ship owners, railroads, truck fleets.

15.) Airports – Change ground-support equipment to electric or alternative fuels; add a “Cell Phone Lot” to reduce idling at passenger pick-up (E.g., Cleveland-Hopkins & Akron-Canton); review fueling practices at minor airports.

# Strategies for Consideration, cont.

(Don't forget stationary and misc. sources...)

- 16.) Road salt – reduce use through policy; consider liquified brine and beet juice.
- 17.) Renewable energy; energy audits for governments and businesses.
- 18.) Plant native trees and shrubs that are known to reduce ozone and/or other pollutants of concern. Preserve existing trees.  
*(Trees are the lungs of the planet.)*
- 19.) Residential combustion – provide funding for retrofits to USEPA-Certified wood fireplaces and wood stoves; enforce “no burn” days when pollution is high.
- 20.) Hydronic heaters (outdoor wood-fired boilers (OWB)) – consider bans, funds for retrofits, adoption of NESCAUM Model Rule.



# Actual Homemade OWB (Source: USEPA)



# Special Considerations in Small & Rural Communities

- Where are the railroad tracks?
  - Related congestion.
  - Locomotive idling.
- Can the transit system/Dial-A-Ride be customized to become more efficient?
- What are the best ways to teach fuel tips and efficient driving techniques?
- Can America recover “conservation” as a value?
- Are truckers “cheating” by routing through your area?
- How can land use planning help?

# Special Considerations: Small & Rural Communities, cont.



- Would USEPA expand Vehicle Inspection & Maintenance (I/M) Programs to more rural areas?
  - Required for moderate ozone nonattainment areas, for all counties influencing ozone.
- Would more nationwide and/or statewide emissions controls on engines be of greatest benefit?
  - Is advocacy called for?

# Careful Planning is Essential

CLOSE TO HOME

BY JOHN McPHERSON



"WELL, YOU KNOW WHAT THIS MEANS?  
NO CHRISTMAS BONUS THIS YEAR."

WWW.CLOSETOHOME.COM

# Conclusions

- Air quality, locally and nationally, was poor but has improved tremendously.
- Achieving more gains will be difficult & expensive.
- Incremental progress is still progress!
  - *Today, it's about the "silver buckshot" not the "silver bullet."*
- Transportation planning can address multiple pollutants simultaneously.
- Pressure will continue from federal sources (USEPA, USDOT, and Congress) to achieve transportation-related air pollution reductions.





Geauga County

## *Questions?*

Amy M. Wainright, Esq.

[awainright@mpo.noaca.org](mailto:awainright@mpo.noaca.org)

(216) 241-2414 x252

[www.noaca.org](http://www.noaca.org)



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