

Update on NC Air Quality & Asthma Research
North Carolina Asthma Summit
May 7, 2013



Presentation Outline

- Clean Air Carolina
- Ground Level Ozone Update
- Particulate Matter Update
- Fracking & Air Quality
- Latest Research on Asthma & Air Quality
- Medical Advocates for Healthy Air
- Q & A

Clean Air

Carolina

Your advocates for healthy air

Our mission is to ensure cleaner air quality for all of us by:

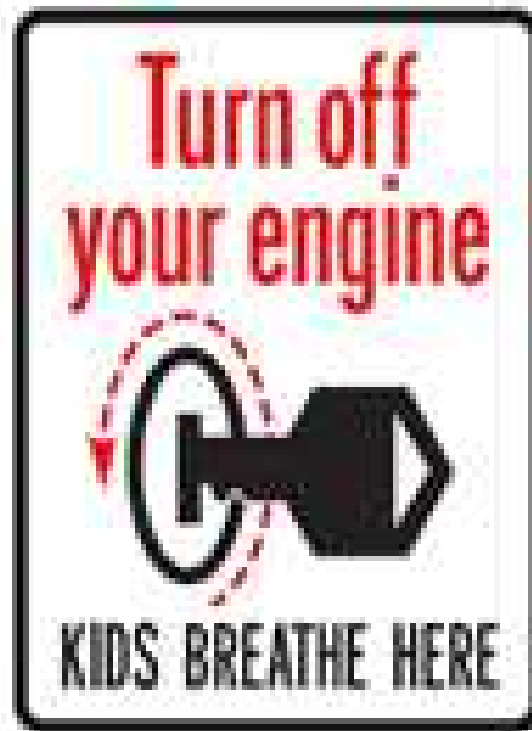
- educating the community about how air quality affects our health
- advocating for stronger clean air policies, and
- partnering with other groups committed to cleaner air and sustainable practices



Clear the Air for Kids!



Air Quality Flags



Anti-idling
Education



Ozone Gardens

NC Clean Diesel Program

- Promotes “Clean Construction Policies” to Hospitals and Universities
- Clean Construction prioritizes new, low-emission equipment and anti-idling policies



Medical Advocates for Healthy Air



Creating a Healthy and Knowledgeable Community



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Medicaladvocatesforhealthyair.org

MAHA

+ Medical Advocates for Healthy Air

[About Us](#) [Priority Issues](#) [Pollution & Health](#) [Clean Air Institute](#) [Action](#) [News](#)



We need your voice!

MAHA is calling on major financiers of the US coal industry to re-direct their investments to clean, renewable energy sources. Please review our letter, to be tailored to the top five coal-investing institutions, and let us know **by May 7, 2013** if you want to add your name to these letters.

[Take Action >>](#)

Medical Advocates Tell NC: Stop the Rush to Frack

April 29, 2013 Filed under Fracking, HIA

Medical Advocates for Healthy Air (MAHA) along with other health and environmental professionals

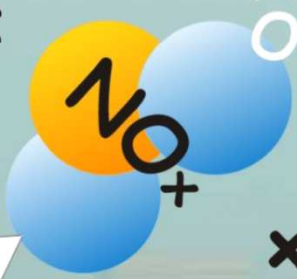
[Join MAHA Today!](#)

Ground Level Ozone Formation



Sunlight

Nitrogen Oxides



Mobile and Combustion Sources



Volatile Organic Compounds

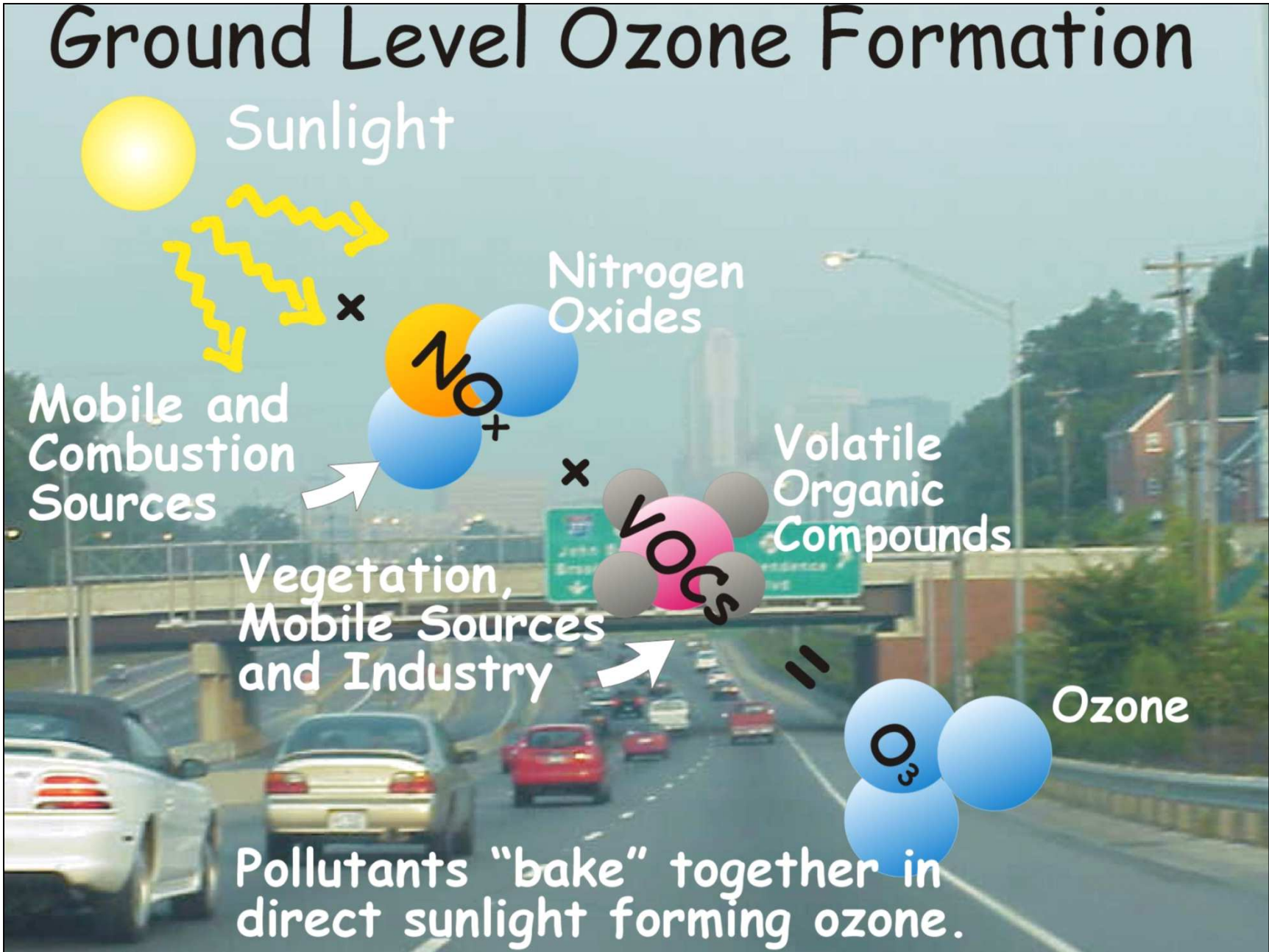


Vegetation, Mobile Sources and Industry

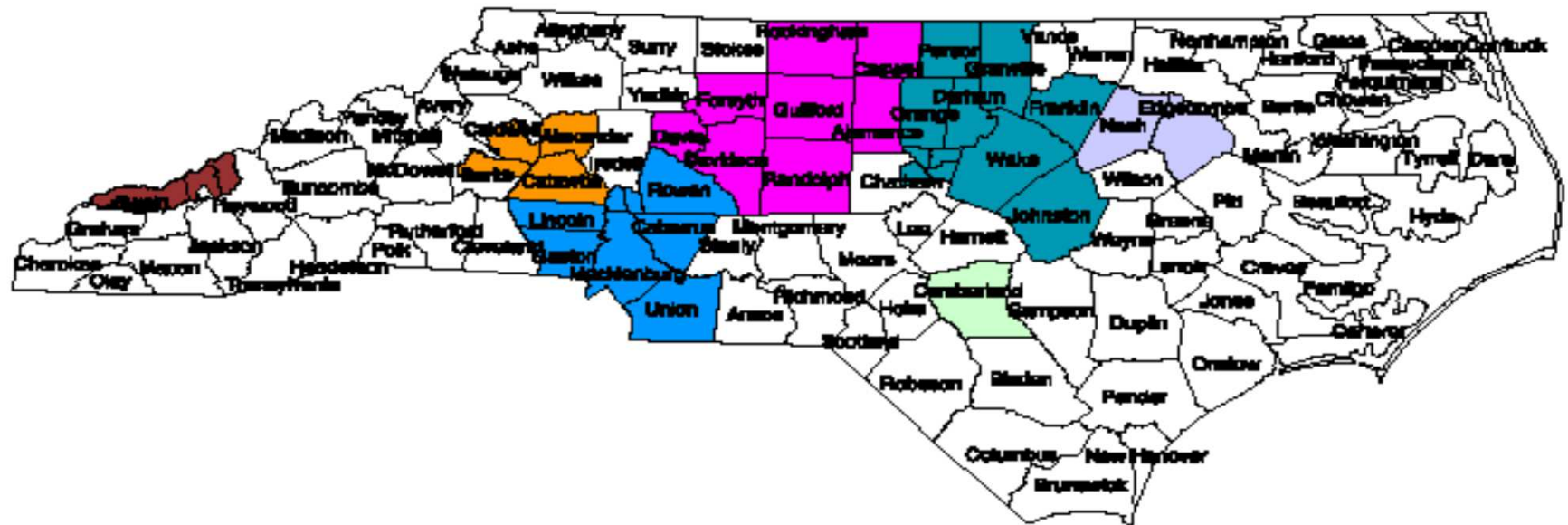


Ozone

Pollutants "bake" together in direct sunlight forming ozone.



EPA's Boundary Designations for 8-Hour Ozone Standards for North Carolina (4/15/04)



- Triangle_cty_415.shp
- ncco_meter.shp
- charlotte_cty_415.shp
- Charlotte_twn_1.shp
- Triad_cty_415.shp
- Triangle_twn.shp
- unifour_cty_415.shp
- Mpo_hick_m
- Great Smoky Mtn.
- Fayetteville Area.shp
- Rockmount_cty_415.shp



Notes:
 Charlotte area: Moderate, Max. attainment date: June 2010
 Triad area (EAC): Marginal, Max. attainment date: Dec. 2007
 Triangle area: Basic, Max. attainment date: June 2008
 Unifour area(EAC): Basic, Max. attainment date: Dec 2007
 Haywood & Swain cos: Basic, Max. attainment date: June 2009
 Fayetteville area(EAC): Basic, Max. attainment date: Dec 2007
 Rocky Mount area: Basic, Max. attainment date: June 2008

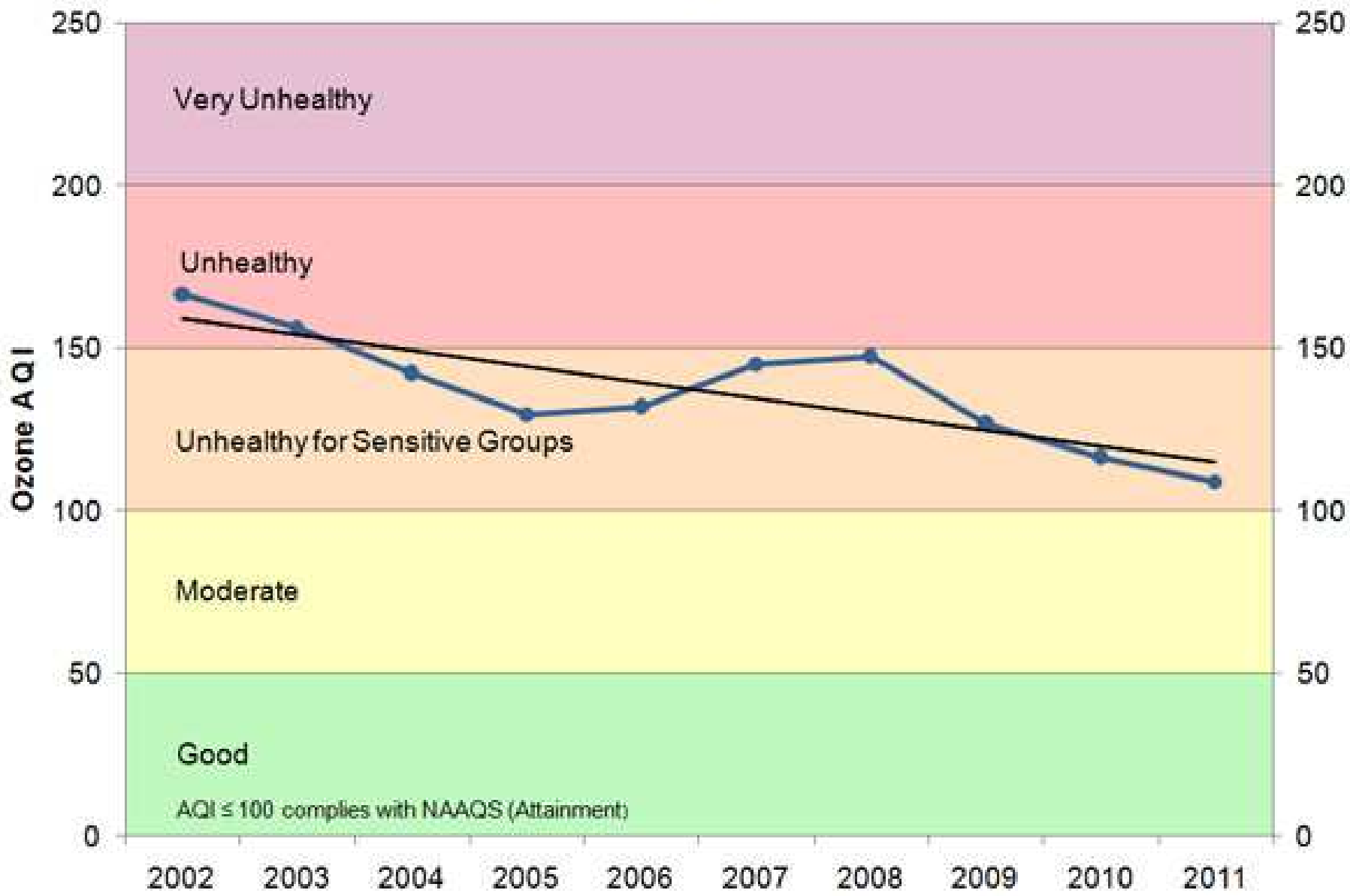
ALA State of the Air 2013

- Charlotte-Gastonia-Rock Hill:
19th smoggiest for ground-level
ozone
- Report Card Grade: “F”
- Forsyth and Rowan: “F”
- <http://www.stateoftheair.org/2013/states/north-carolina/>



Ozone Air Quality Index - Mecklenburg County, NC

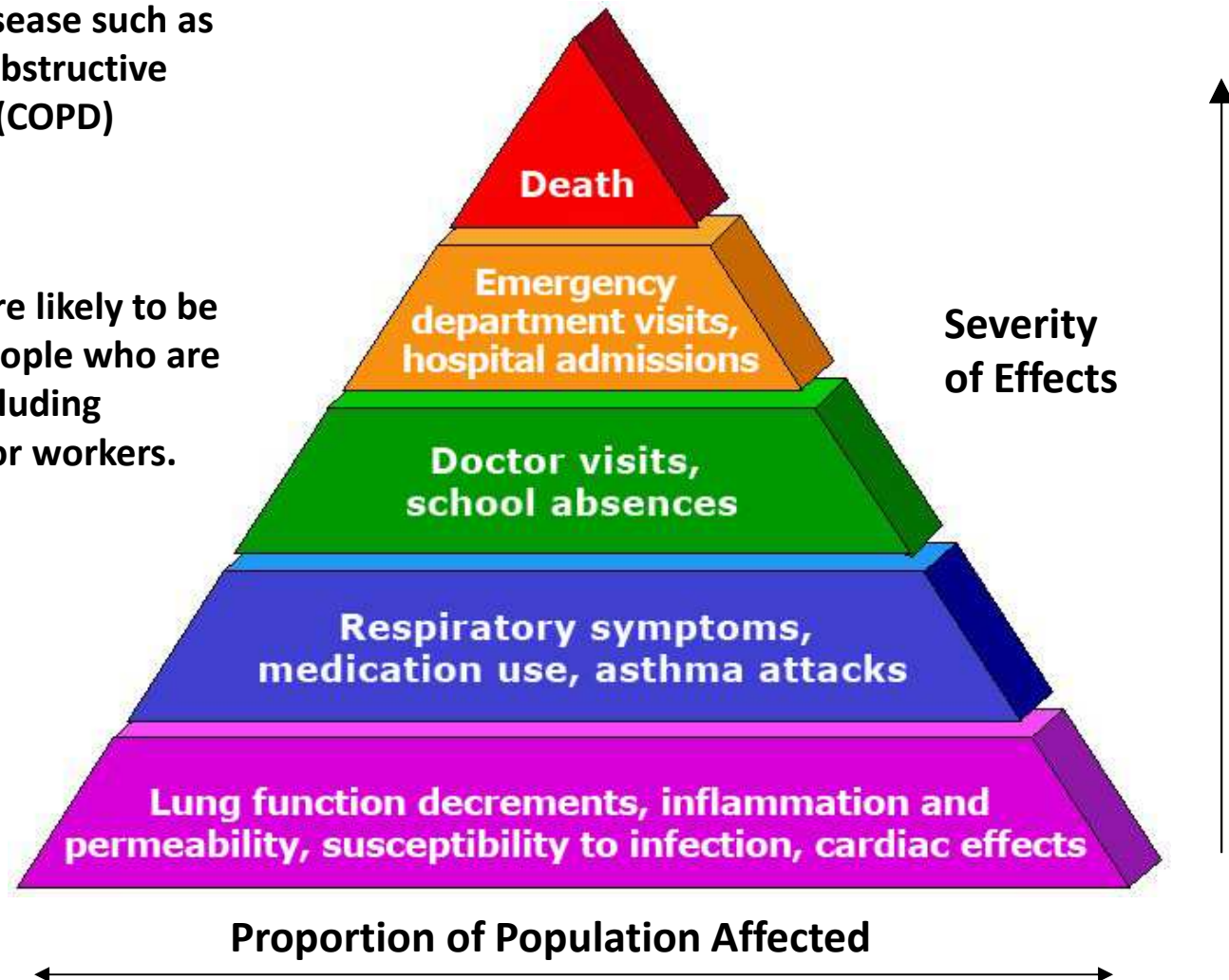
NAAQS Compliance Value (8-hour) Converted to AQI



Ozone Health Impacts: “Pyramid of Effects”

At-risk groups include:

- People with lung disease such as asthma or chronic obstructive pulmonary disease (COPD)
- Children
- Older adults
- People who are more likely to be exposed, such as people who are active outdoors, including children and outdoor workers.



Ozone and Your Patients' Health

EPA's Training Course for Health Care Providers

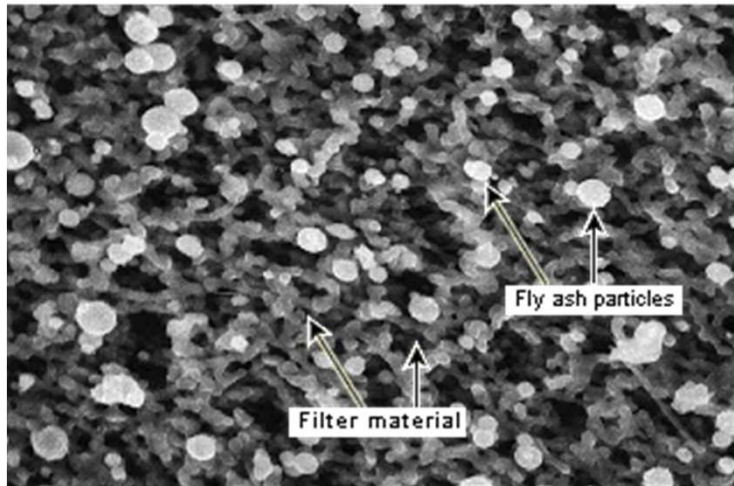
- Designed for family practice doctors, pediatricians, nurse practitioners, and asthma educators who counsel patients about asthma, air pollution, or exercise
- Patients and their families may also use this material to learn the science behind ozone's effect on respiration and how to manage their respiratory health using the Air Quality Index
- CME credit is available for the course
- <http://www.epa.gov/o3healthtraining/>

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What is Particulate Matter?

Figure 1. Photomicrograph of Fly Ash Particles on an MCE Filter



Source: Courtesy of Air Control Techniques, P.C.

Image from <http://www.epa.gov/eogapti1/module3/distribu/distribu.htm>

Particulate matter (PM) describes a wide variety of airborne material. PM pollution consists of materials (including dust, smoke, and soot), that are directly emitted into the air or result from the transformation of gaseous pollutants.

Sources of PM and PM Precursors



Mobile Sources
(vehicles)
VOCs, NO₂, PM



Stationary Sources
(power plants, factories)
NO₂, SO₂, PM



Area Sources
(drycleaners, gas stations)
VOCs



Natural Sources
(forest fires, volcanoes)
PM

Particulate Matter: Size Matters

Size is important to the behavior of PM in the atmosphere and human body and determines the entry and absorption potential for particles in the lungs.

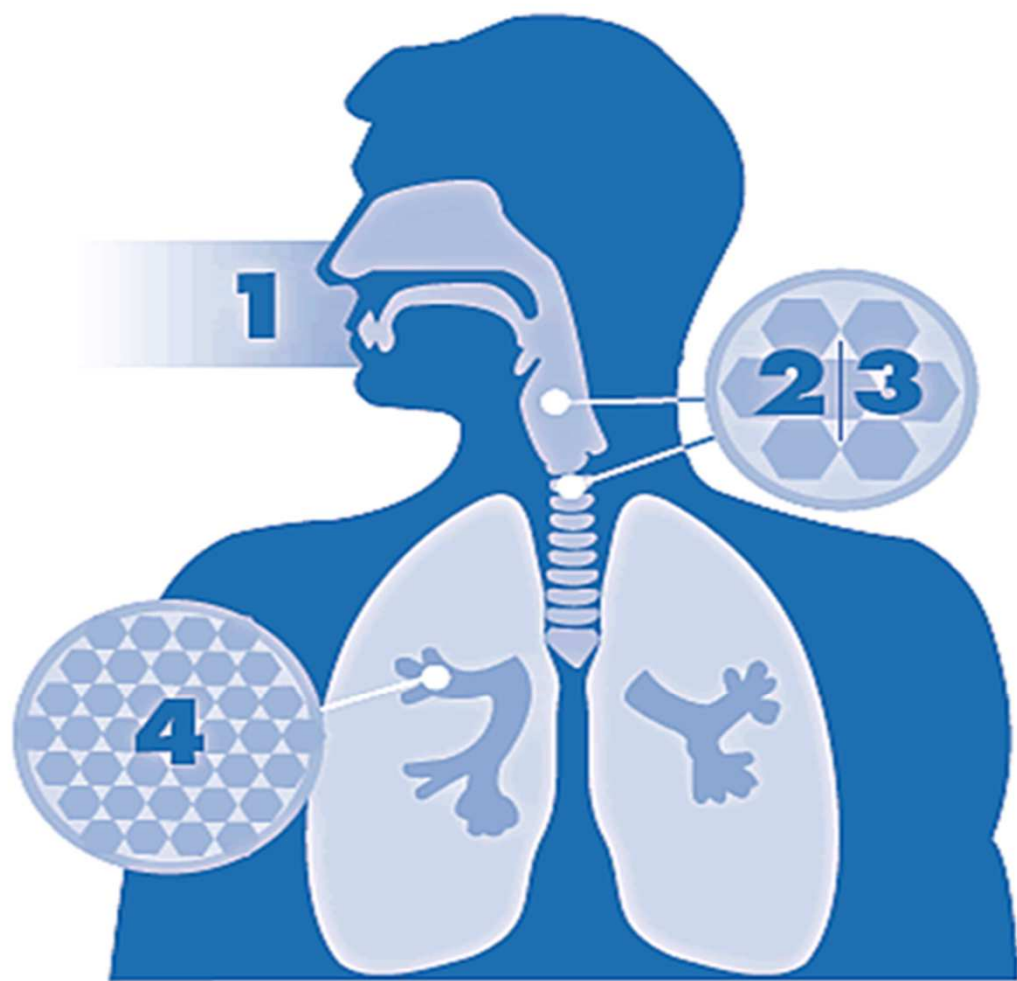
- Particles larger than $10 \mu\text{m}/\text{m}^3$ are trapped in the nose and throat and never reach the lungs.
- Therefore, particles $10 \mu\text{m}/\text{m}^3$ in diameter or less are of most concern for their effects on human health.



Particulate Matter: Size Matters

- Particles between 5 and 10 $\mu\text{m}/\text{m}^3$ are removed by physical processes in the throat. Particles smaller than 5 μm reach the bronchial tubes.
- Particles 2.5 $\mu\text{m}/\text{m}^3$ in diameter or smaller are breathed into the deepest portions of the lungs and have been known to cross the blood-brain barrier.





- 1** Particulate matter enters our respiratory (lung) system through the nose and throat.
- 2|3** The larger particulate matter (PM₁₀) is eliminated through coughing, sneezing and swallowing.
- 4** PM_{2.5} can penetrate deep into the lungs. It can travel all the way to the alveoli, causing lung and heart problems, and delivering harmful chemicals to the blood system.

What Adverse Health Effects Have Been Linked to PM?

- Pre-term birth
- Low birth weight
- Hospital admissions and ER visits for heart and lung disease
- Respiratory symptoms and medication use in people with chronic lung disease and asthma
- Decreased lung function
- Cerebral stunting
- Lung cancer
- Exacerbation of COPD
- Stroke
- Development of chronic lung disease
- Heart attacks
- Premature death



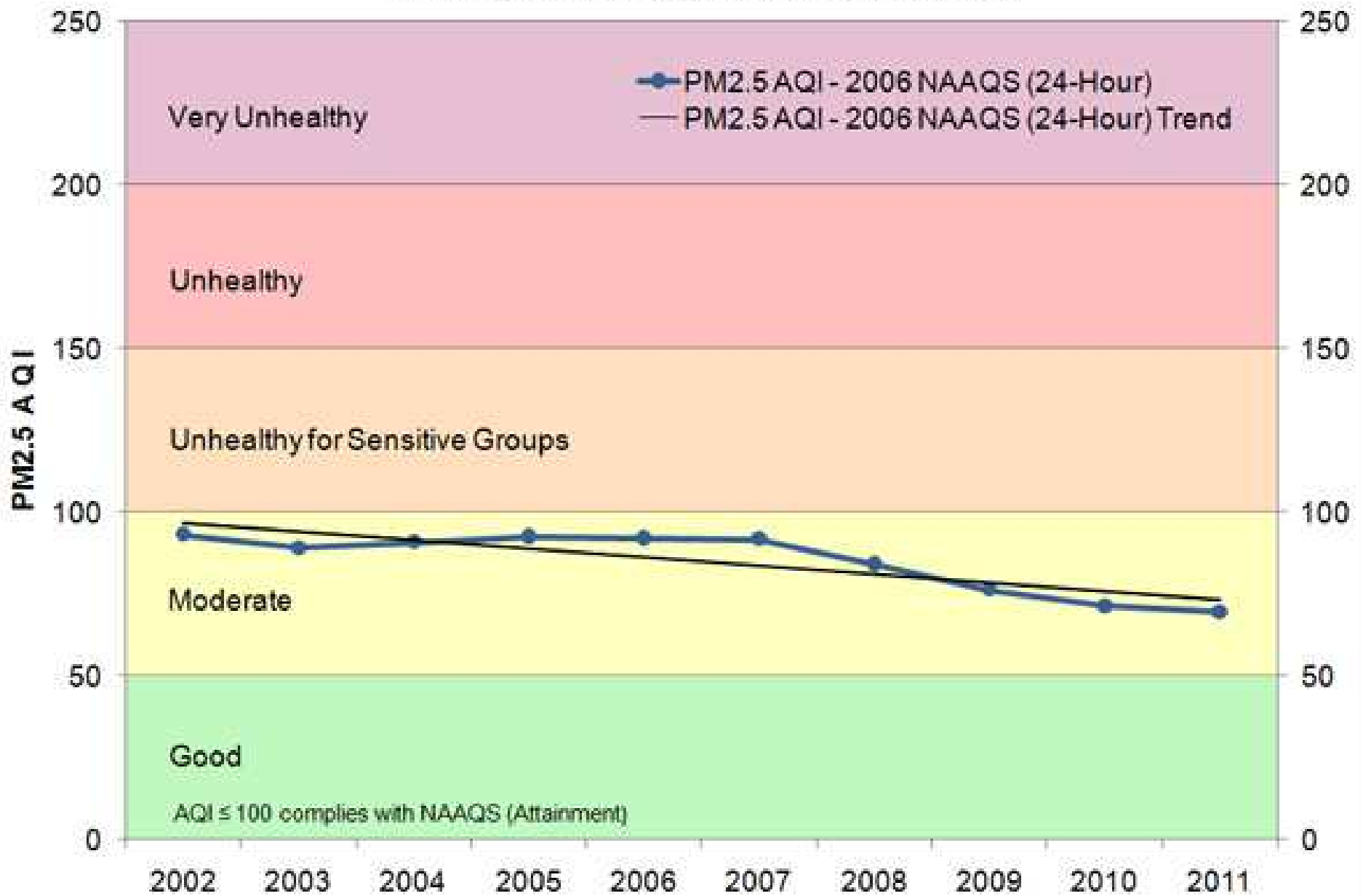
Particulate Matter Exposure

- Emitted at ground level where people breathe, is inhaled during daily life
- There is no safe level of particulate matter exposure (HEI National Morbidity and Mortality Particulate Matter Study, 2004)
- The Good News: Mortality is reduced when particles are reduced (Harvard Six Cities Study, 2006)



Particulate Matter (PM2.5) Air Quality Index - Mecklenburg County, NC

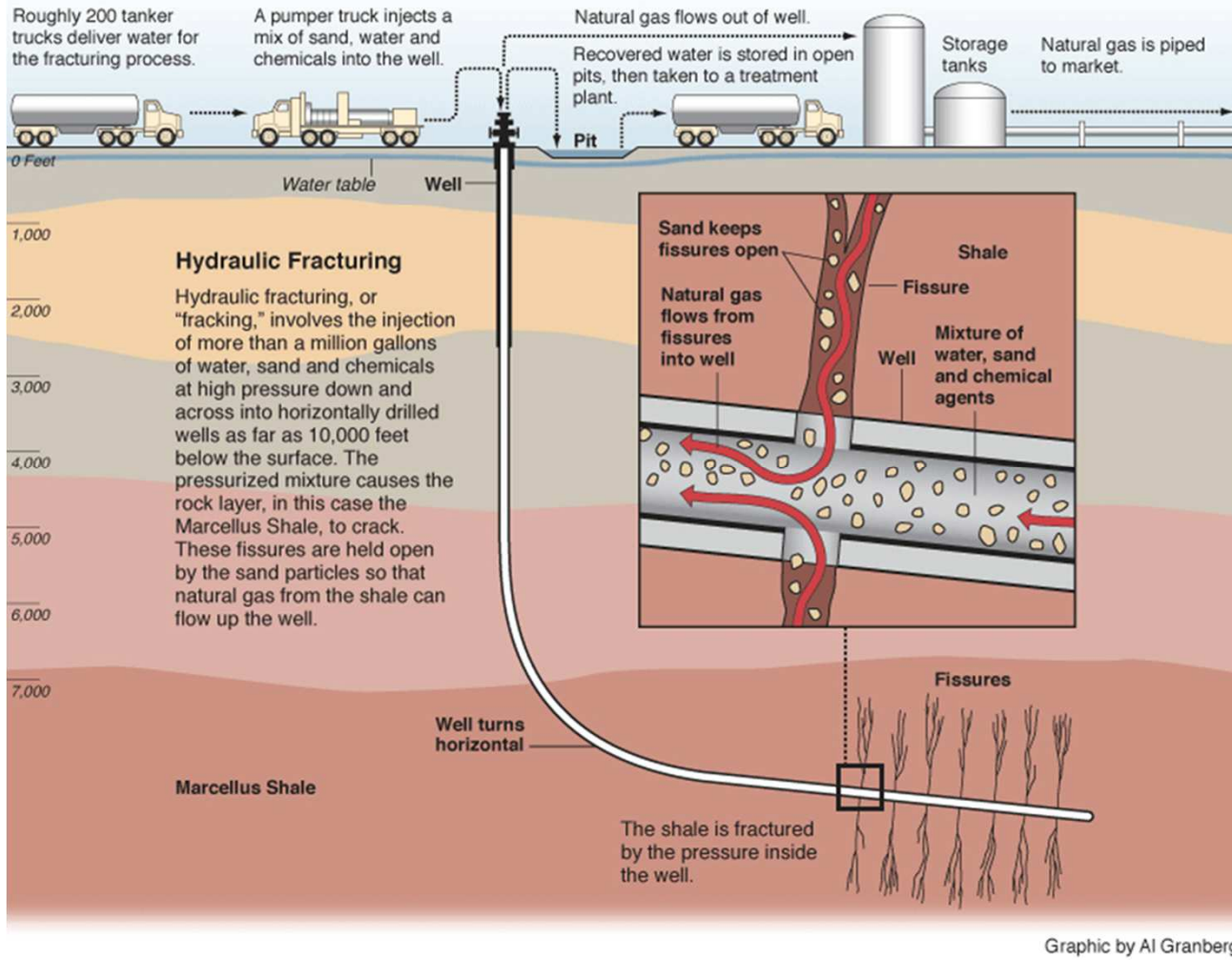
NAAQS Compliance Value (24-hour) Converted to AQI



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Fracking and Air Pollution



What Is Hydraulic Fracturing?

- Millions of gallons of water, sand and chemicals pumped underground to break apart the rock and release natural gas
- Process currently in use worldwide; expanded operations will increase environmental damage both short- and long-term
- Some countries—France, Bulgaria—ban practice outright
- NC Governor Perdue vetoed it in NC, state legislators overrode veto in Summer 2012

How Does Fracking Impact Air Quality?

- Fracking effects the total environment, both immediate and long-term.
 - Mining and transport of sand and proppants: One shale (deep) well can use 4 million lbs. of proppant, which must be mined and transported, both of which increase air pollution
 - Use of dozens of toxic chemicals known to be cancerous to humans and wildlife, including benzene, a known contributor to lung cancer. A four million gallon fracturing operation (one well) could use 80 to 330 TONS of chemicals, including VOCs that are off-gassed into environment

How Does Fracking Impact Air Quality?

- Emissions during flow-back stage, release both chemicals and naturally occurring hydrocarbons previously contained by shale, including methane and radon—again, a known lung-cancer contributor
- 25-100% of chemical-laced fluids return to the surface, including radioactive wastes. Much off gassing occurs during transport and treatment. Treatment facilities are overwhelmed by volume of waste, and often not licensed to handle this kind of waste.

Visit www.earthwatch.org for detailed explanations

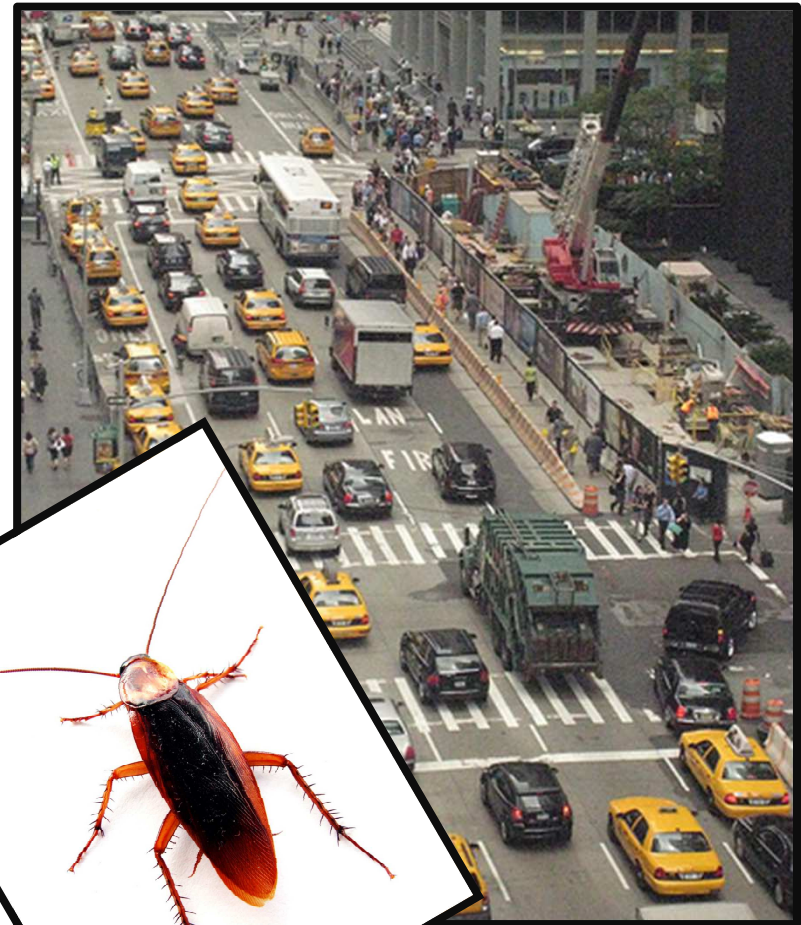
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“Early-life cockroach allergen and polycyclic aromatic hydrocarbon exposures predict cockroach sensitization among inner-city children”

*Matthew Perzanowski (Columbia University) et al;
Journal of Allergy and Clinical Immunology*

- New York City, 2012
- Prenatal exposure to cockroach allergens increase potential for asthma
- Potential for asthma further increased by:
 - Exposure to polycyclic aromatic hydrocarbons (diesel emissions)
 - Gene mutation
- Prenatal **and** early childhood exposure to PAH and cockroach increase risk



“Childhood Incident Asthma and Traffic-Related Air Pollution at Home and School”

*Rob McConnell (University of Southern California) et al;
Environmental Health Perspectives*

- California; 2010; kindergarteners and first graders
- Relationship established already between traffic and asthma
- Wanted to know if traffic and school related to asthma development
- Traffic-related pollution exposure at school and homes may both contribute to the development of asthma



“South Bronx Environmental Health Policy Study”

George Thurston (New York University School of Medicine) et al; New York University School of Medicine and Environmental Protection Agency

- South Bronx and Brooklyn, NYC; 2006; various aged schoolchildren
- Overall goal of study: ID ambient air pollution sources and impacts
- Neighborhood sees a LOT of diesel traffic and also has many health issues
 - 1991-1996: rate of asthma hospital admissions for all ages was 2x that of Brooklyn and Manhattan
- Changed from stationary air pollution monitors to mobile ones via students’ backpacks to best account for all exposure kids were getting
 - Many schools very close to several major highways so this = concern



“Chronic burden of near-roadway traffic pollution in 10 European cities”

*Laura Perez (Swiss Tropical and Public Health Institute) et al;
European Respiratory Journal*

- Collated results from multiple studies completed over years; released 2013
- Entire “chronic disease progression” can be attributed to air pollution no matter what disease cause was
- Calculated asthma burden caused by traffic pollution and urban air pollution
- Exposure to high traffic = 14% all asthma cases
- Cause asthma and exacerbate existing conditions

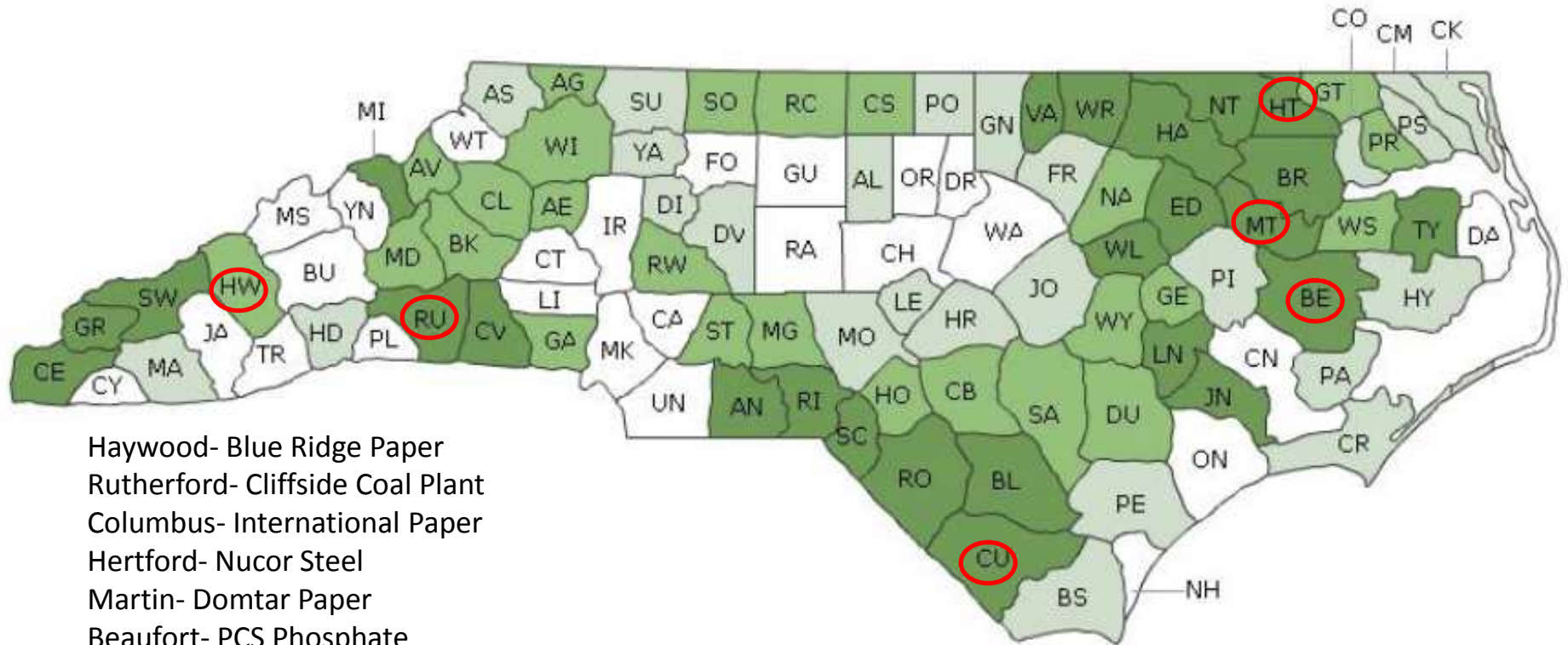


Medical Advocates for Healthy Air



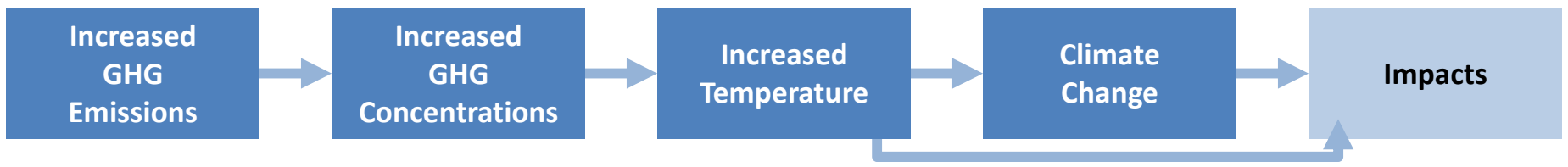
Location of Major Emission Sources

HEALTH OUTCOMES

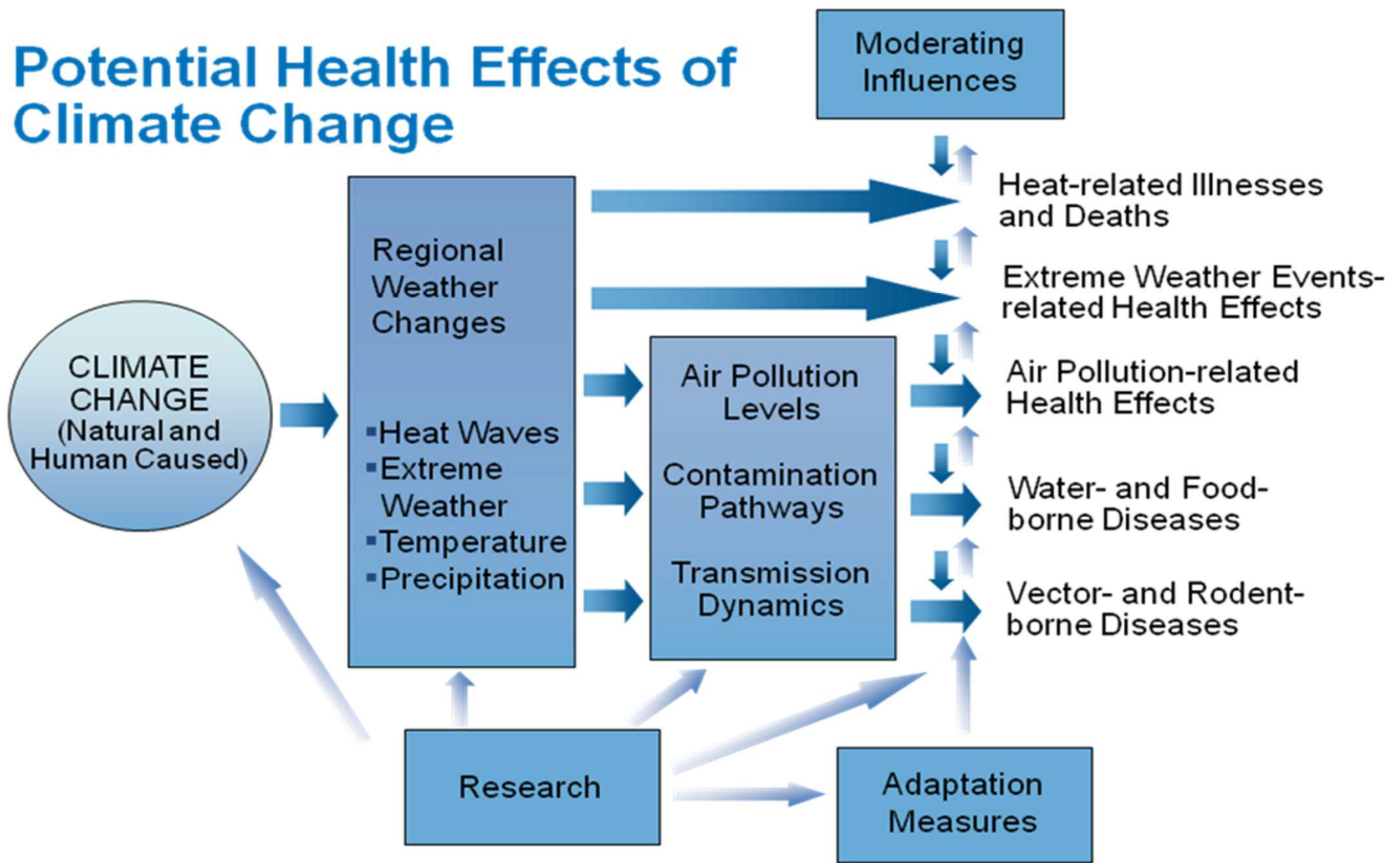


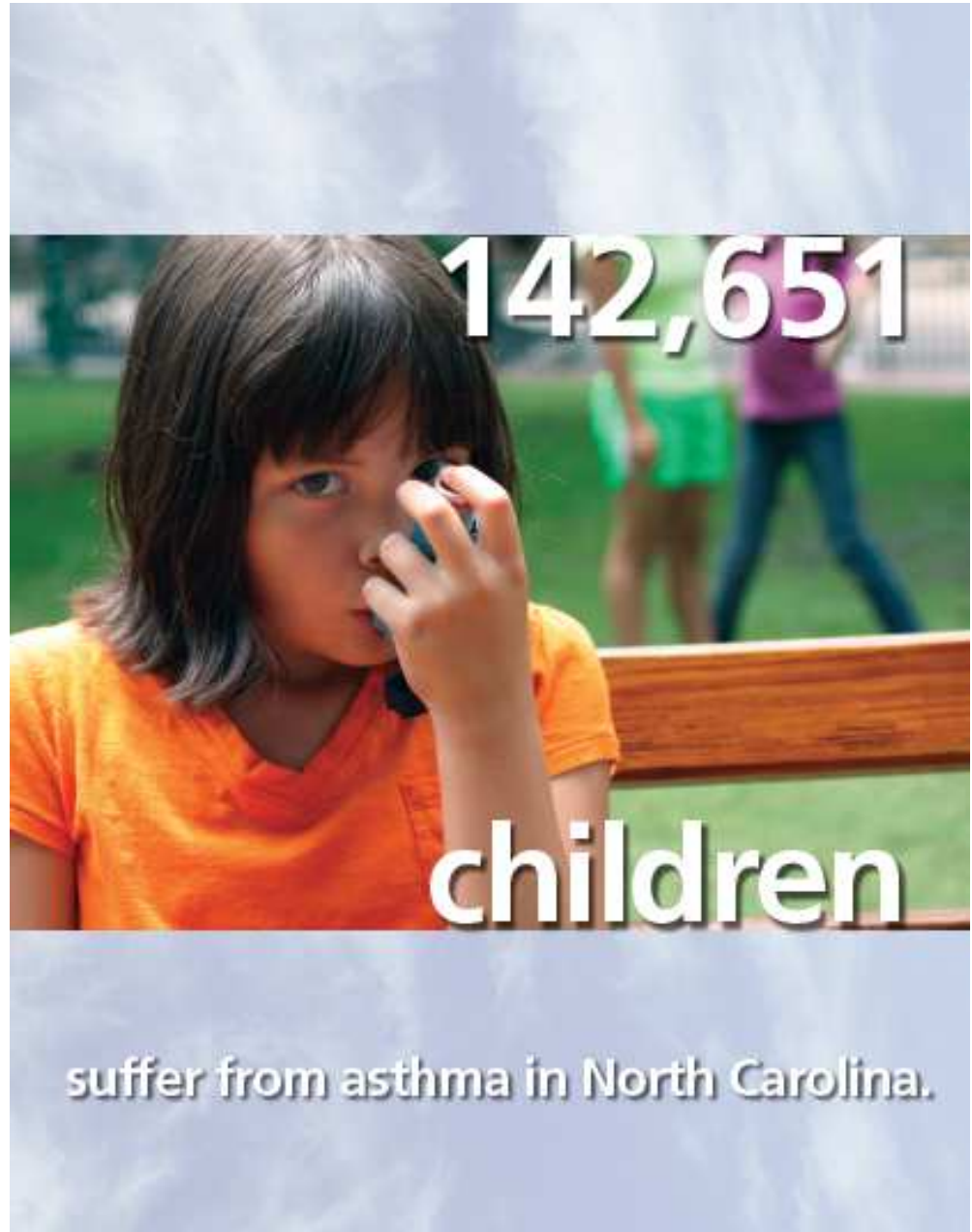
Health Outcomes are Ranked 1-100
Higher Rankings (dark green) = worse
health outcomes

<http://www.countyhealthrankings.org>



Potential Health Effects of Climate Change





Clean Air

Carolina

Your advocates for healthy air

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Join Medical Advocates for Healthy Air
(it's free!)

www.cleanaircarolina.org