

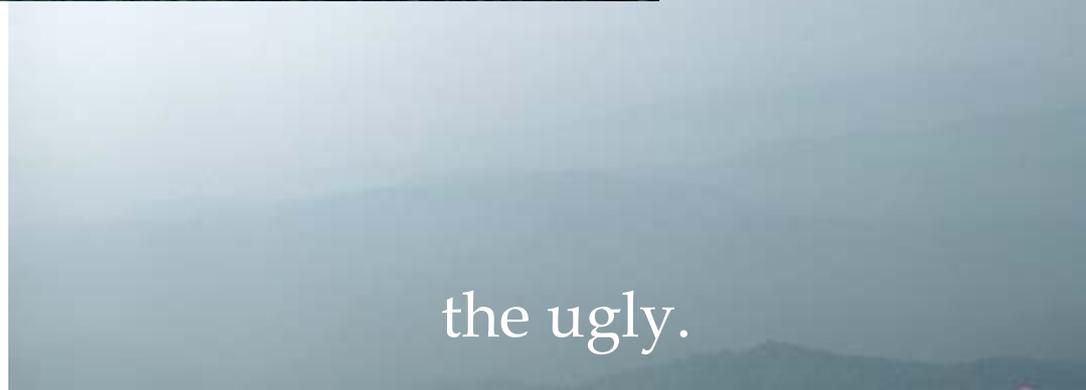
Air Quality in North Carolina



The good.....



the bad.....



the ugly.

Brian Eder
Atmospheric Modeling and Analysis Division
National Exposure Research Laboratory
U.S. Environmental Protection Agency

The Environmental Protection Agency has established both *Primary* and *Secondary* standards, known as the National Ambient Air Quality Standards (**NAAQS**) for the following six “Criteria” pollutants:



Ozone (O₃)
Particulate Matter PM_{2.5} and PM₁₀
Carbon Monoxide (CO)
Sulfur Dioxide (SO₂)
Nitrogen Dioxide (NO₂)
Lead (Pb)

Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

The NAAQS have been revised and amended throughout the years, accounting for evolving scientific understanding of the various pollutants and their impacts.

The Environmental Protection Agency has established both *Primary* and *Secondary* standards, known as the National Ambient Air Quality Standards (**NAAQS**) for the following six “Criteria” pollutants:



Ozone O_3
Particulate Matter $PM_{2.5}$ and PM_{10}
Carbon Monoxide CO
Sulfur Dioxide SO_2
Nitrogen Dioxide NO_2
Lead Pb

Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

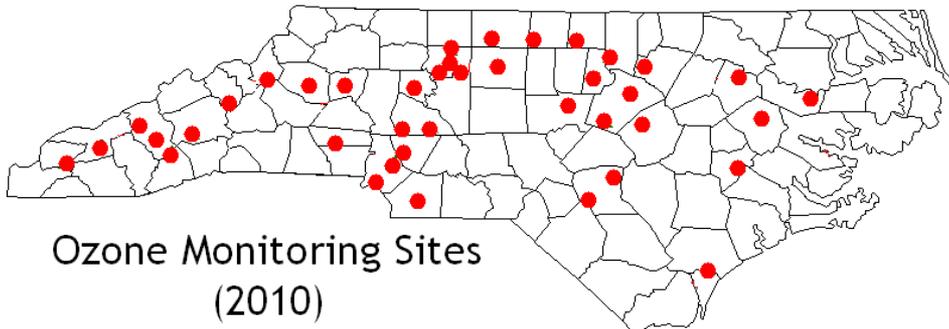
Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

The NAAQS have been revised and amended throughout the years, accounting for evolving scientific understanding of the various pollutants and their impacts.

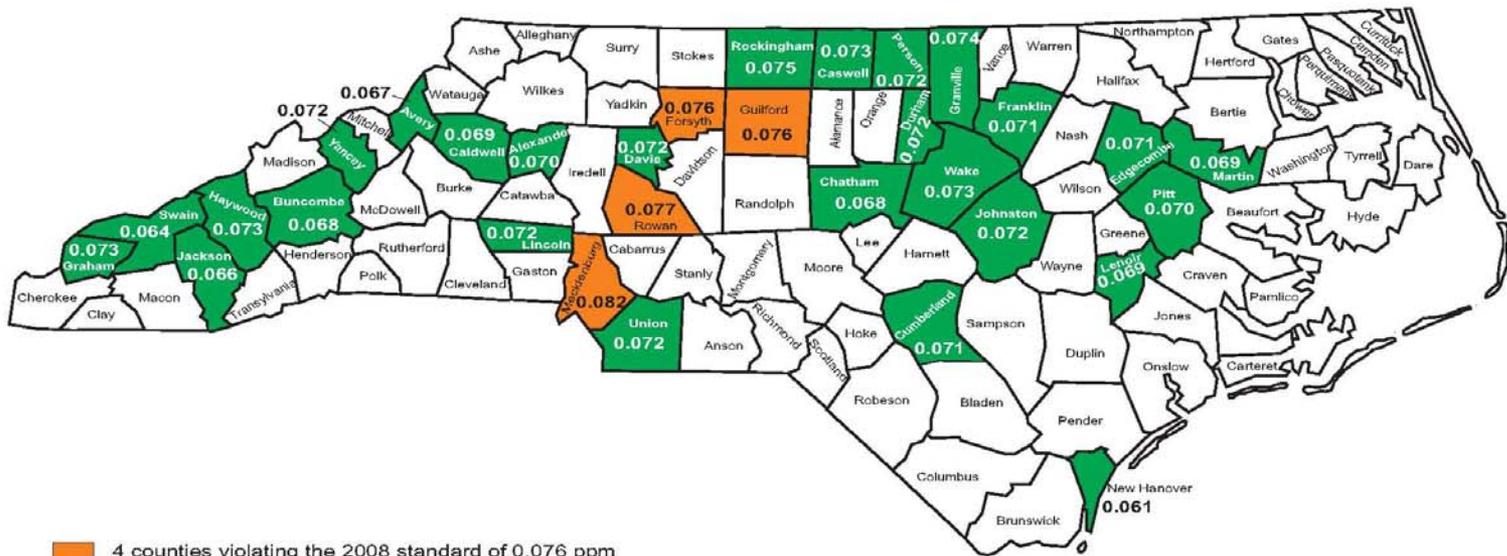
Ozone is a product of *nitrous oxides* (NO_x) and *Volatile Organic Compounds* (VOCs) in the presence of heat and sunlight. The major sources of NO_x and VOCs are motor vehicle exhaust, industrial emissions, and chemical solvents.

- > O_3 exhibits a strong seasonality, peaking during the “Ozone Season”, which for North Carolina, runs from 1 April – 31 October.

To attain the NAAQS, the 3-year average of the fourth-highest daily. maximum 8-hour average concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May, 2008)



North Carolina Counties with 8-Hour Ozone Violations, 2008-2010



- 4 counties violating the 2008 standard of 0.076 ppm
 - 27 counties attaining the 2008 standard of 0.076 ppm
- *sampling did not satisfy EPA summary criteria; design value shown is provisional

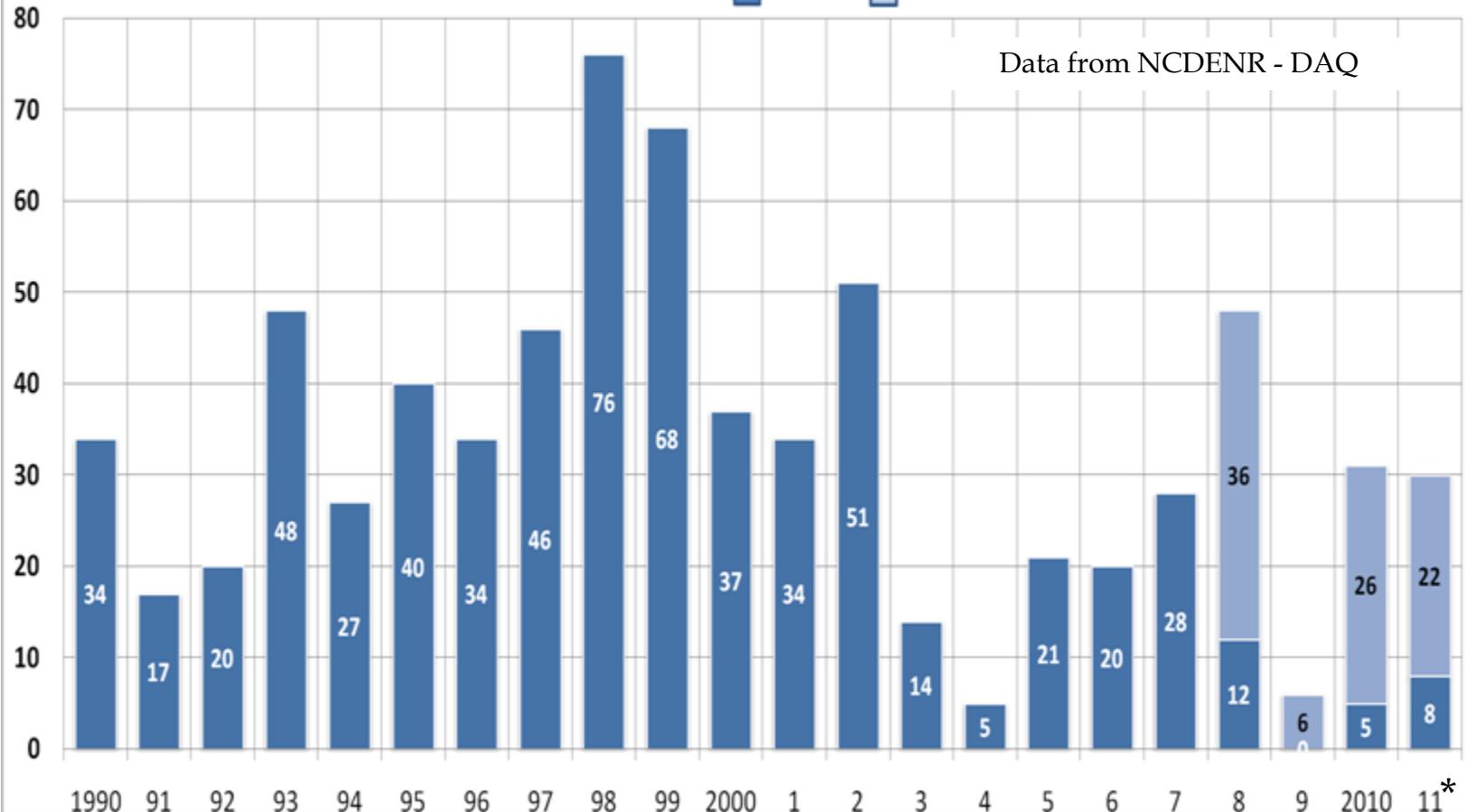
NOTE:
 — additional counties may be involved in emission reduction strategies
 — nonattainment designations may differ from county boundaries

N.C. DENR
 DAQ/Statistical Services
 using TIBCO Spotfire S+(R)
 Not To Scale
 Fri Mar 11 09:53:59 EST 2011

Number of Days in NC with Exceedances of 8-hr Ozone Average

85 ppb 75 ppb

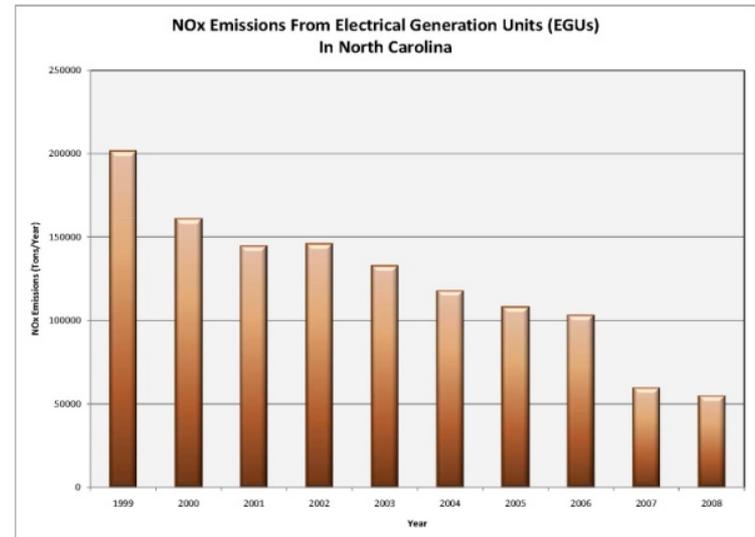
Data from NCDENR - DAQ



* 2011 data through August 10th

Contributing to the decline in O₃ exceedences are State and Federal actions to reduce ozone-forming emissions from power plants, other industry and motor vehicles. These measures include:

The N.C. Clean Smokestacks Act of 2002, which required the state's 14 coal-fired power plants to cut by three-fourths their emissions of ozone forming emissions by the end of 2012.



Legislation that expanded the motor vehicle emissions testing program from the State's nine most urban counties to 48 counties in 2006.

Stricter federal and state standards for gasoline and diesel engines in new cars, trucks and construction equipment.

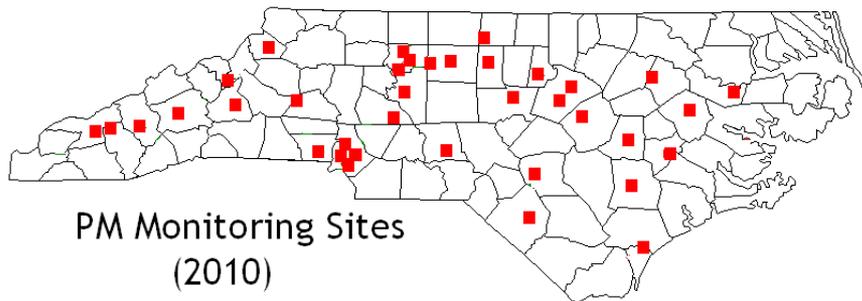
Particulate Matter include dust, dirt, soot, and smoke. Some particles are *primary* (directly emitted into the air) by motor vehicles, factories, and wood burning and forest fires. Other particles are *secondary* (formed in the air when gases from burning fuels react with sunlight and water vapor).

- > The size of particle is directly linked to their potential for causing health problems. EPA is especially concerned about particles that are $\leq 2.5 \mu$ in diameter ($PM_{2.5}$ or “Fine particles”), because these particles can penetrate deep into the lungs.

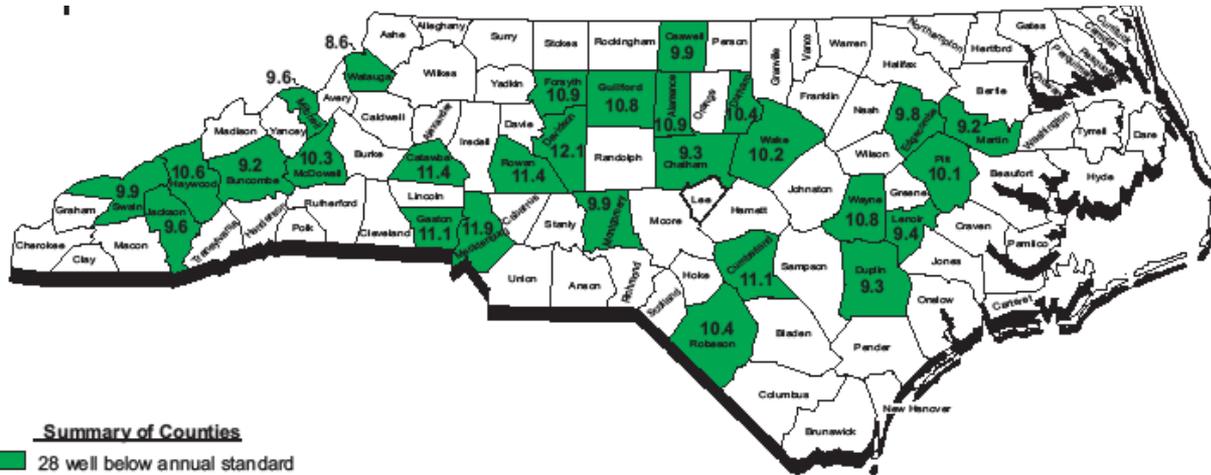
*To attain: the **annual** NAAQS, the 3-year average of the weighted annual mean $PM_{2.5}$ conc. from single or multiple community-oriented monitors must not exceed $15.0 \mu\text{g}/\text{m}^3$.*

*the **24-hr** NAAQS, the 3-year average of the 98th percentile of 24-hour conc. at each population - oriented monitor within an area must not exceed $35 \mu\text{g}/\text{m}^3$*

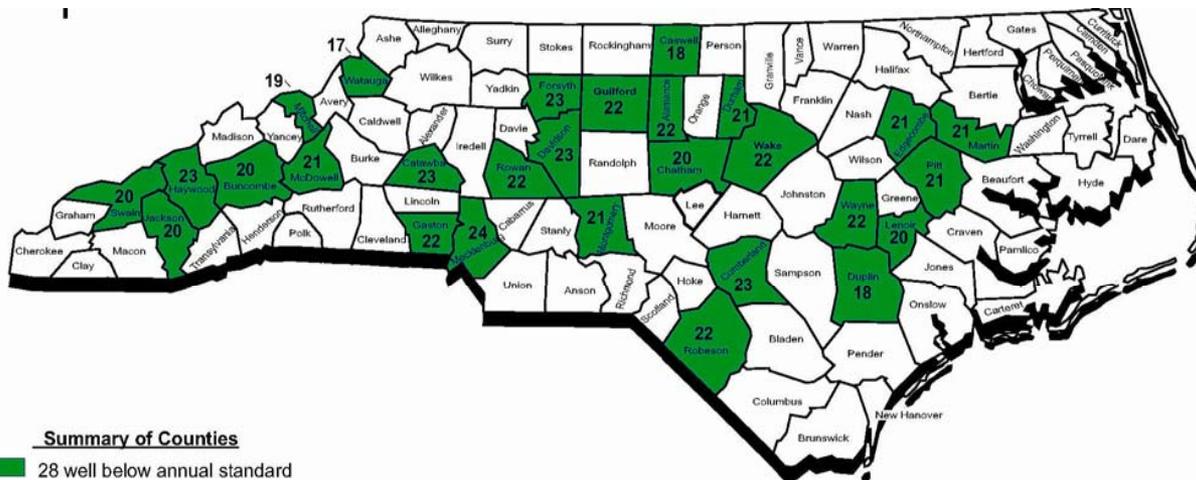
(effective Dec., 2006).



NC PM_{2.5} “Annual Standard” Design Values 2008-2010



NC PM_{2.5} “Daily Standard” Design Values 2008-2010





The Air Quality Index (AQI) was developed by the EPA in order to provide the general public with a simple, accessible, and uniform assessment of air quality at a specific location, based on five of the “criteria pollutants”.

Ambient concentrations for each of the pollutants are converted to a numerical scale ranging from 0 to 500, **where 100 corresponds to the EPA primary standard.**

The AQI is then determined by the pollutant with the highest scaled concentration (almost always O_3 or $PM_{2.5}$) and a subjective description of *good*, *moderate*, *unhealthy for sensitive groups*, *unhealthy*, *very unhealthy*, or *hazardous*, is then disseminated to the public.



Air Quality Index categories with their O₃ and PM_{2.5} concentration breakpoints.

AQI	Max. 8 – Hr Conc. (ppm)	PM _{2.5} 24-hour (µg m ⁻³)
Good (0 – 50)	0.000 – 0.059	0 -15.4
Moderate (51 - 100)	0.600 – 0.075	15.5 – 35.4
Unhealthy for Sensitive Groups (101 – 150)	0.076 -0.095	35.5 – 55.4
Unhealthy (151 – 200)	0.096 -0.115	55.5 – 140.4
Very Unhealthy (201 – 300)	0.116 -0.374	140.5 – 210.4



Air Quality Index categories with their O₃ and PM_{2.5} response recommendations.

AQI	Ozone	PM _{2.5}
Good (0 – 50)	None	None
Moderate (51 - 100)	Unusually sensitive people should consider limiting prolonged outdoor exertion.	Unusually sensitive people should consider reducing prolonged or heavy exertion
Unhealthy for Sensitive Groups (101 – 150)	The following groups should limit prolonged outdoor exertion: People with lung disease , such as asthma <ul style="list-style-type: none"> •Children and older adults •People who are active outdoors 	People with heart or lung disease , older adults, and children should reduce prolonged or heavy exertion.
Unhealthy (151 – 200)	The following groups should avoid prolonged outdoor exertion: People with lung disease, such as asthma <ul style="list-style-type: none"> •Children and older adults •People who are active outdoors Everyone else should limit prolonged outdoor exertion.	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 (201 – 300)	The following groups should avoid all outdoor exertion: <ul style="list-style-type: none"> •Children and older adults •People who are active outdoors Everyone else should limit outdoor exertion.	People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.



Where can AQI information, including forecasts be found?



EPA, NOAA, NPS, tribal, state, and local agencies developed the AIRNow Web site to provide the public with easy access to national air quality information. The Web site offers daily AQI forecasts as well as real-time AQI conditions for over 300 cities across the US, and provides links to more detailed State and local air quality Web sites.

[AIRNow - North Carolina Air Quality](#)

North Carolina Department of Environment and Natural Resources

Division of Air Quality



To Protect and Improve the Outdoor Air Quality of North Carolina

The Division of Air Quality (DAQ) works with the state's citizens to protect and improve outdoor, or ambient, air quality in North Carolina for the health and benefit of all. To carry out this mission, the DAQ has programs for monitoring air quality, permitting and inspecting air emissions sources, developing plans for improving air quality, and educating and informing the public about air quality issues.

[NCDENR](#) Website



NOAA NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE



National Air Quality Forecast Capability

NWS AQ Forecast

Vision

To provide the US with ozone, particulate matter and other pollutant forecasts with enough accuracy and advance notice to take action to prevent or reduce adverse effects.

Thank you!

Contact Information:

Brian Eder

eder.brian@epa.gov

541-3994