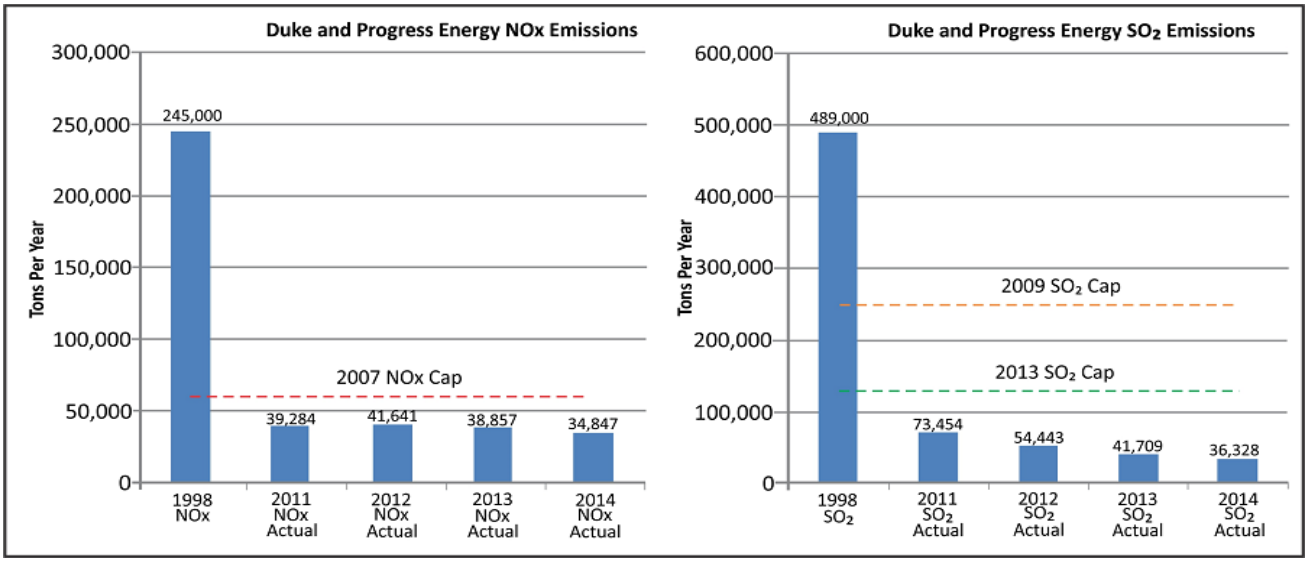
Air Quality Trends in North Carolina

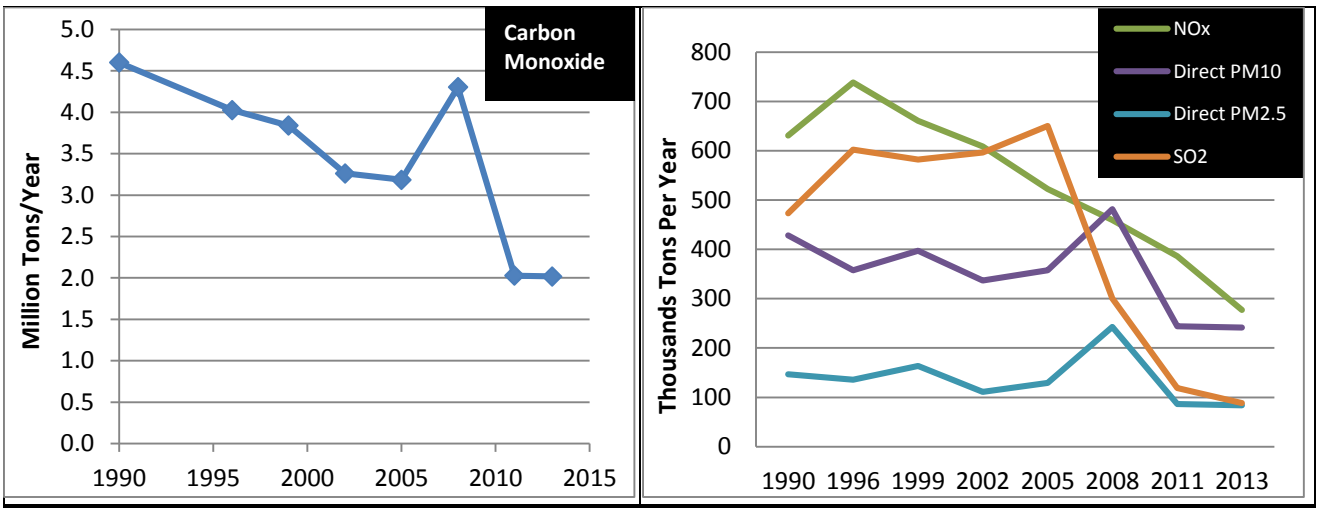
N.C. Division of Air Quality, June 2015

North Carolinians are breathing cleaner air today than any time in decades. State leaders, agencies, public utilities and private industries have taken significant steps in recent years to address air quality concerns – notably ozone and particle pollution - and this work is achieving impressive results. For example, harmful emissions from coal-fired power plants operating in North Carolina have been drastically cut following the passage of the NC Clean Smokestacks Act in 2002. Equipped with 21st century control technology, the state's coal fired power plants are among the most efficient and least polluting coal fleet in the nation.

Clean Smokestacks Act Emissions Reductions



Annual Statewide Emissions*



*Significant wildfire event occurred in 2008, substantially increasing carbon monoxide (CO) and particulate emissions.

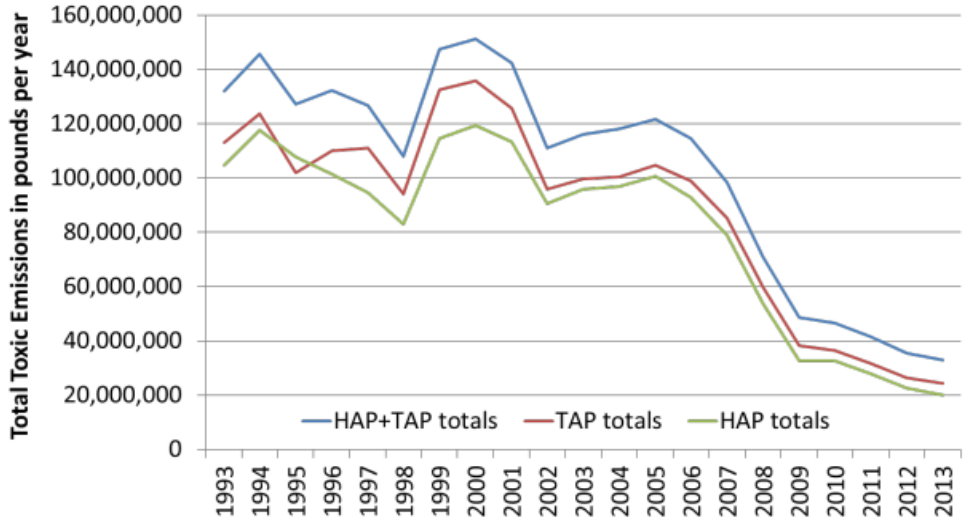
Ambient Air Measurements

Air quality and visibility have improved substantially across North Carolina. In the past, extensive portions of North Carolina had ozone levels exceeding the health based standard, and the areas once officially designated by the EPA as not meeting air quality standards included more than 30 counties in the Charlotte, Fayetteville, Rocky Mount, Triad and Triangle metro areas as well as the Great Smoky Mountains National Park. Today all areas of the state qualify as meeting the national air quality standards established by EPA for the protection of public health and the environment. The following charts show measured levels of air toxics, carbon monoxide, lead, ozone, particle pollution (PM), sulfur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide and visibility.

Air Toxics

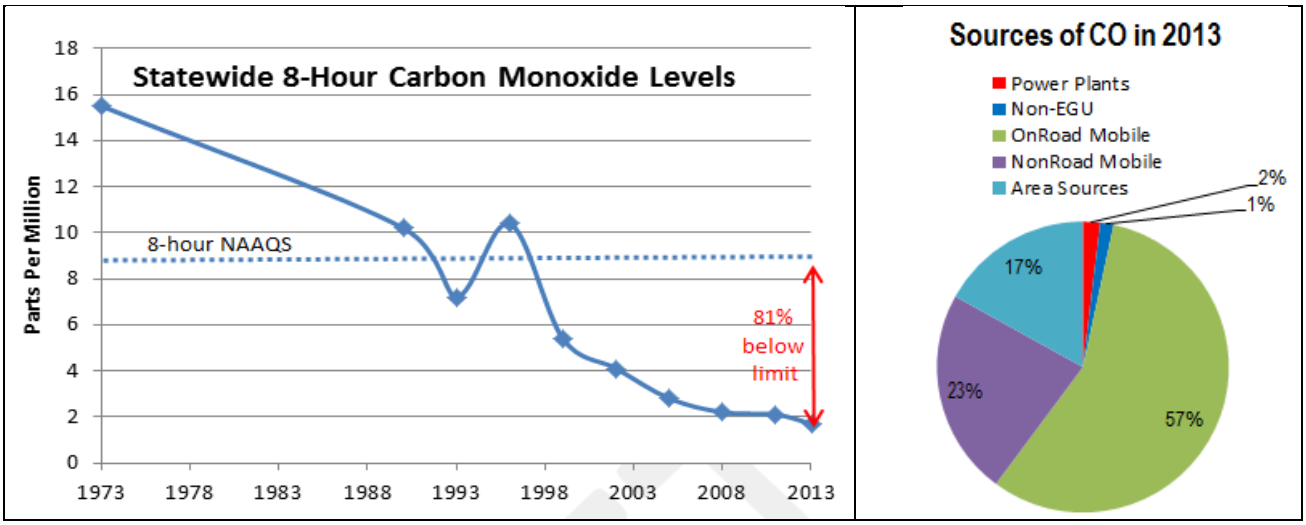
Industry has taken many measures to reduce its hazardous air pollutants (HAP) emissions. These include upgrading processes with advanced valve seals, leak detection systems and state of the air control technology. Where practical, the use of hazardous chemicals in manufacturing processes has been eliminated or reduced.

Figure 1. Long-term air toxic emissions changes 1993-2013



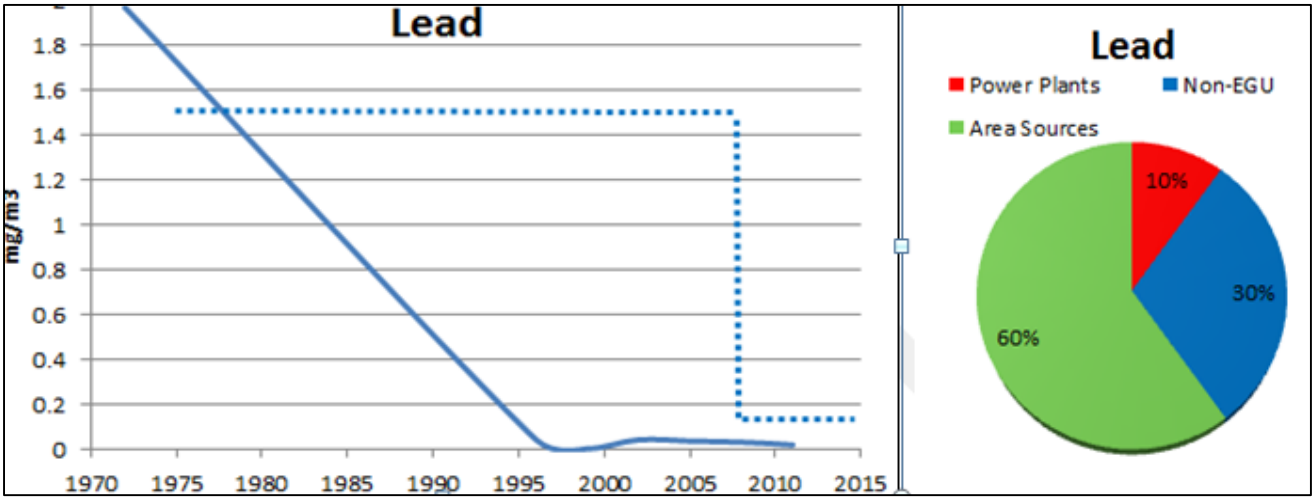
Carbon Monoxide

Improvements in evaporative controls, catalyst design and fuel control systems have contributed to significant reductions in ambient carbon monoxide (CO) concentrations and other pollutants. The EPA finds that new cars, trucks and non-road vehicles are about 99 percent cleaner for common pollutants (such as CO, nitrogen oxides (NOx), particulates and hydrocarbons) as compared to 1970 vehicle models.



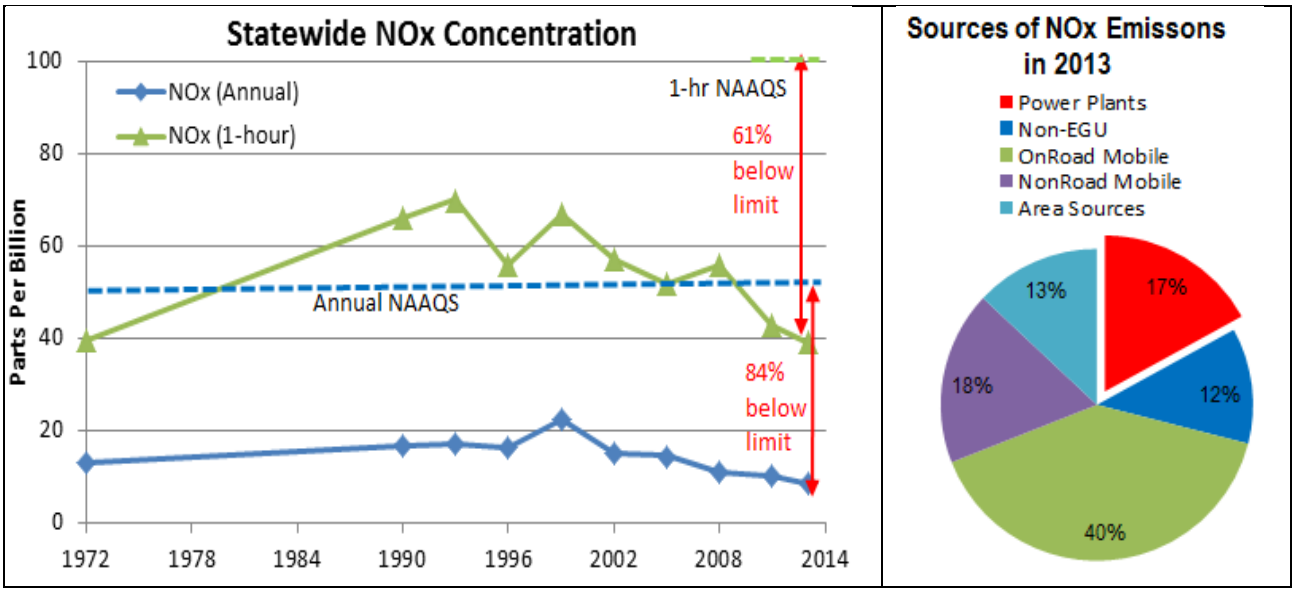
Lead:

The phase out of lead in motor vehicle gasoline under Clean Air Act has led to dramatic reductions in airborne lead pollution and its adverse health effects.



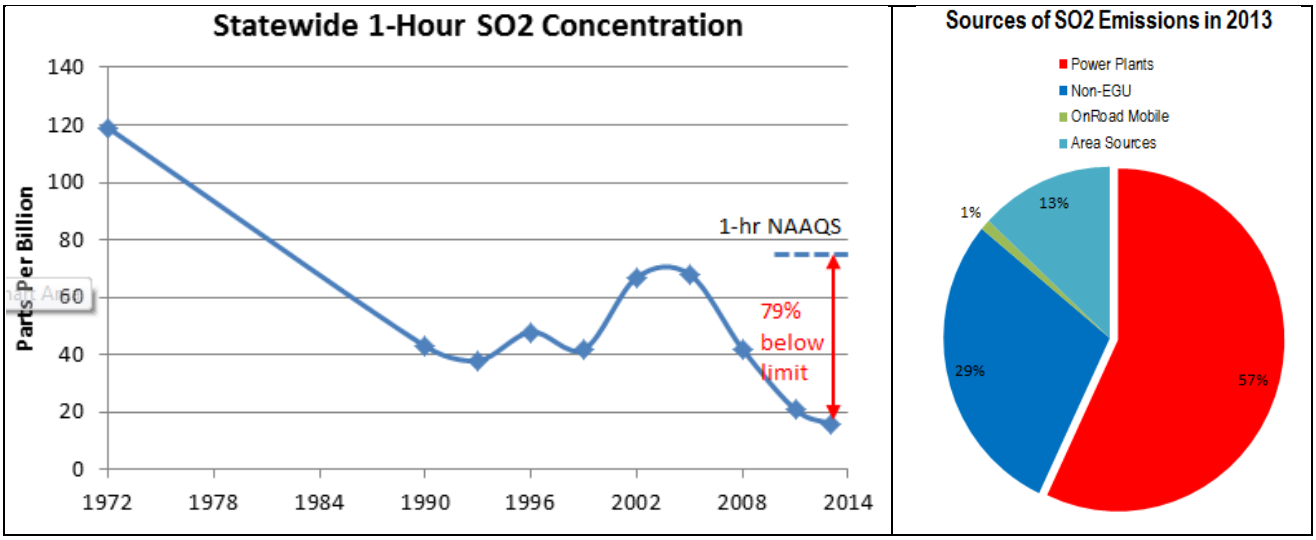
Nitrogen Dioxide

Improved vehicle standards, fuel efficiencies, ultra-low NOx burners and selective catalytic reduction emissions controls have contributed to substantial reductions in NOx emissions. For example, the EPA states, “new coal-fired power plants typically install control devices that capture up to 98 percent of the sulfur dioxide and in many cases 90 percent of the nitrogen oxide emissions, relative to uncontrolled levels.”



Sulfur Dioxide

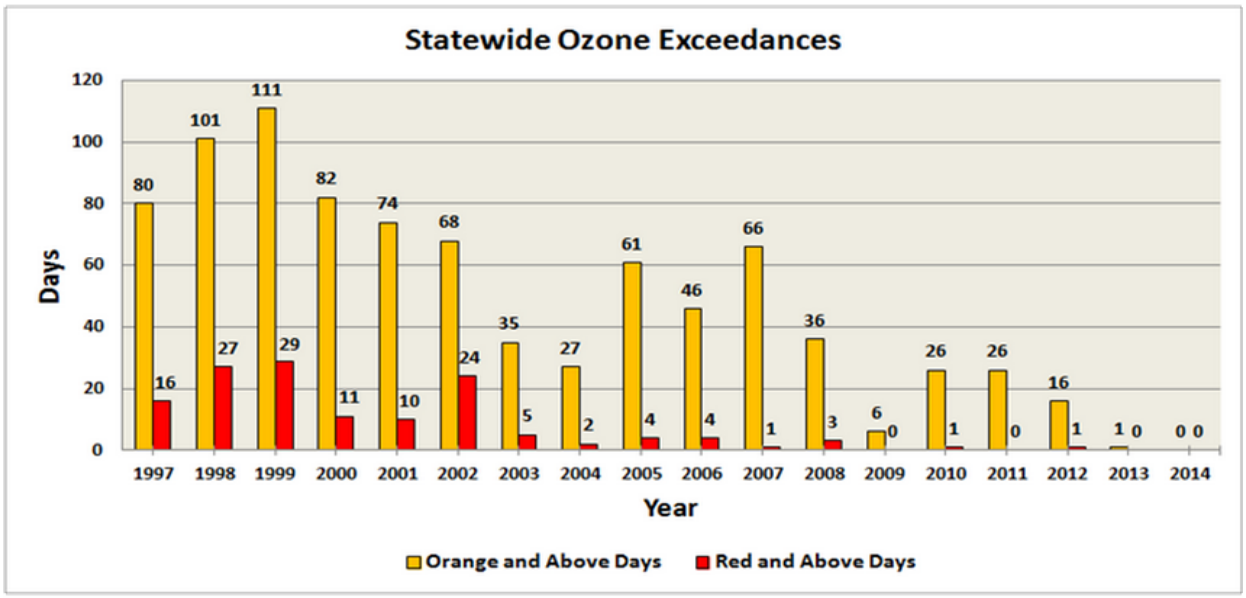
Lower sulfur content in fuel[1], state-of-the-art scrubbers and the increasing use of natural gas-fired combined cycle combustion turbine plants for electricity generation have led to substantial drops in SO2 emissions.

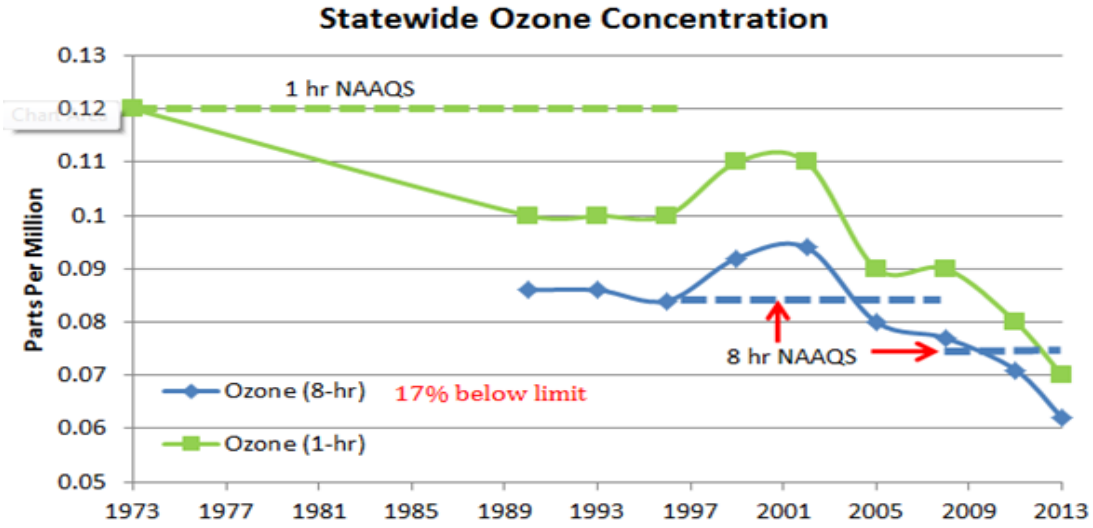


Ozone

Reductions in NO_2 emissions have markedly reduced the formation of ground level ozone. In fact, Ozone levels in North Carolina were the lowest on record during the past two years, with only one exceedance of the standard in 2013 and none in 2014. The following chart shows statewide ozone exceedances by year since 1997.

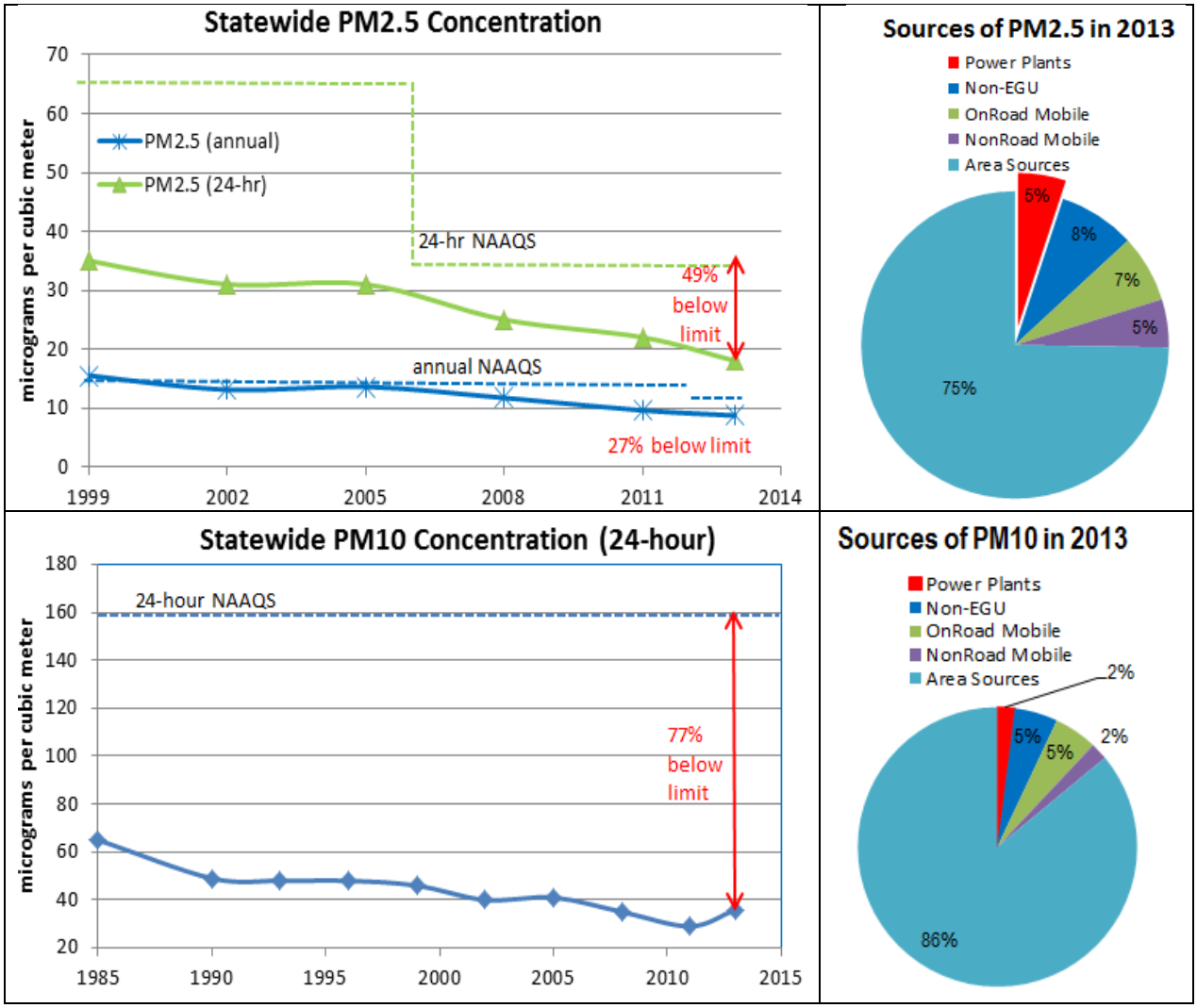
[1] Since the 1960's, the sulfur content of gasoline and diesel fuel has dropped by 90% and 99 %, respectively.


Statewide Ozone Exceedances
Days
Year
Orange and Above Days
Red and Above Days
1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
80 16
101 27
111 29
82 11
74 10
68 24
35 5
27 2
61 4
46 4
66 1
36 3
6 0
26 1
26 0
16 1
1 0
0 0


Statewide Ozone Concentration
Parts Per Million
1 hr NAAQS
8 hr NAAQS
Ozone (8-hr)
17% below limit
Ozone (1-hr)
1973 1977 1981 1985 1989 1993 1997 2001 2005 2009 2013

Particle Pollution

Large reductions in both direct particulate matter and nitrogen oxide and sulfur dioxide[2] emissions from fossil fuel-fired power plants and mobile sources have led to significantly lowered ambient particulate matter ($PM_{2.5}$ and PM_{10}) levels.



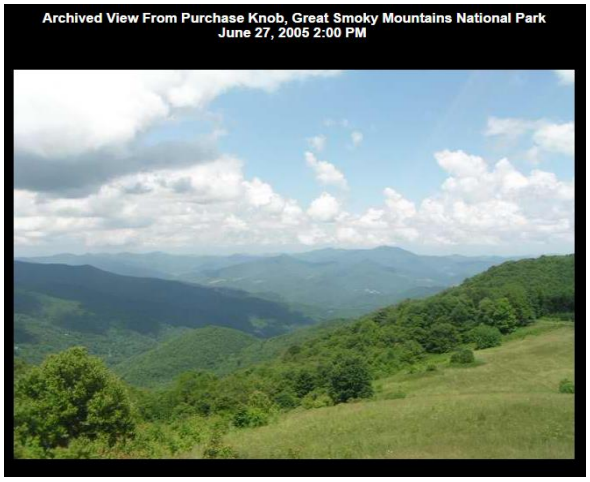
Visibility

The scenic panoramas in our national and state parks are clearer due to reductions in sulfur dioxide emissions and other air pollutants that block light. During hazy days, the vast majority of light extinction is caused by ammonium sulfate particles. However, these fine particles are no longer the major source of light extinction on clear days. The photos below, which capture the clearest day of the month, show an increase in the viewshed distance from 2005 to 2015.

[2] Sulfate is about a third of the total measured particulates.

Great Smoky Mountains National Park

Purchase Knob webcam on the clearest day in June.[3]

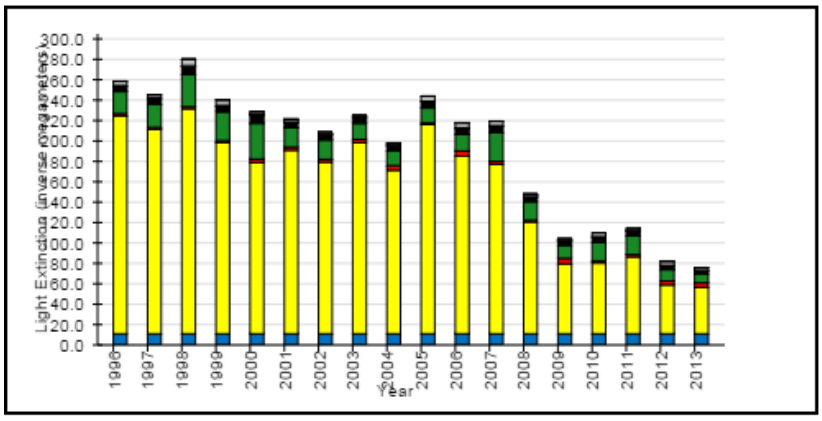


June 27, 2005

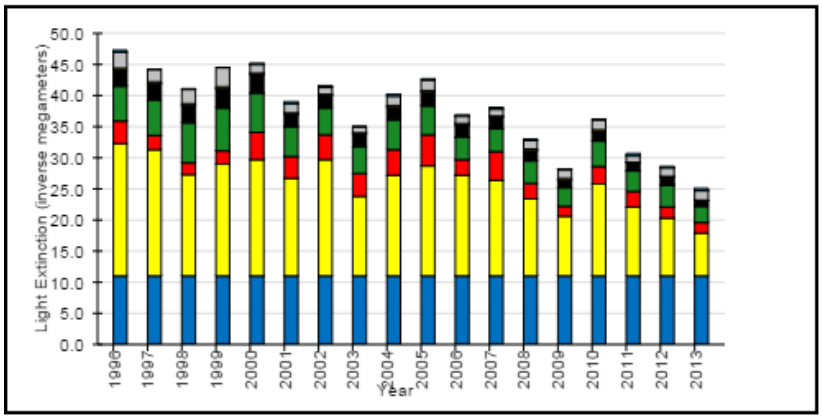
June 4 ,2015

[Great Smoky Mountains National Park- Slickrock]

Haziest Results - Fine Particles Contribution to Light Extinction



Clearest Results - Fine Particles Contributions to Light Extinction



Light Extinction Particles

- Sea Salt
- Coarse Mass
- Soil
- Light Absorbing Carbon
- Organic Carbon
- Ammonium Nitrate
- Ammonium Sulfate
- Rayleigh

The standard visual mile range on the haziest days

1998: 9 miles
2013: 32 miles

The standard visual mile range on the clearest days

1997: 51 miles
2013: 91 miles

[3] **See**: http://www.nature.nps.gov/air/WebCams/parks/grsmpkcam/grsmpk_arc.cfm