ANNUAL REPORT

Air Quality

2010

west virginia department of environmental protection

2010 Air Quality Annual Report

West Virginia
Department of Environmental Protection
Division of Air Quality
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Charleston, WV 25304

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On December 31, 1970, the Clean Air Act was signed into law by President Richard Nixon. This past year, the U.S. Environmental Protection Agency (EPA) celebrated the 40th anniversary of the signing of this landmark piece of legislation. In 1961, years before the federal law, emissions from the chemical industry in the Kanawha Valley and the steel mills in the Northern Panhandle prompted scrutiny of air pollution in West Virginia, thus creating a need to implement legislation which led to the establishment of the West Virginia Air Pollution Control Commission (APCC). Both our state regulations and the federal Clean Air Act addressed numerous environmental challenges, making our air today much cleaner than it was decades ago.

Director's Page

This *2010 Annual Report* highlights the West Virginia Department of Environmental Protection's (DEP) ongoing efforts and the air pollution trends measured by our air monitoring network. Ambient air quality sampling sites, located throughout West Virginia, monitor air pollutants on either a continuous or periodic basis, and are located to assess air quality levels based on population exposure and industrial emissions. Using data collected through this network, the charts and graphs cited in this report illustrate the steady decline in air pollutant levels and continued improvement in air quality.
New research and advanced science continue to discover more about the effects of air pollution on human health and the environment, thus creating new challenges and the need to constantly reevaluate our programs and regulations. For example, although total emissions of the air pollutants listed with National Ambient Air Quality Standards (NAAQS) have decreased in the past 20 years, data in this report reflect exceedences for sulfur dioxide (SO_2) because of revisions to the standard this past June. Another challenge arose when the EPA adopted a national mandatory reporting rule for facilities that emit greenhouse gases. As West Virginia had its own GHG reporting rule, rather than require sources to double report, the DEP decided to comply with the rule by accepting the federal data collected.

Over the past year, the Division of Air Quality (DAQ) took part in an initiative by the EPA to understand whether outdoor toxic air pollution poses health concerns to school children. DAQ installed and operated air toxics monitors around three West Virginia schools. Initial monitoring and the subsequent reports were completed and results are available through the EPA's website www.epa.gov/schoolair. These monitoring results will help the EPA develop a clearer picture of potential risks to children from toxic air pollution.

The DAQ staff continue to collaborate with other entities to raise public awareness and leverage resources on a variety of issues. Outreach efforts include reducing vehicle idling on school campuses, providing small business assistance, encouraging the use of energy efficient products and renewable energy, and helping to secure funding for new cleaner diesel school bus replacements.

I hope this report will provide a better understanding of the quality of the air in West Virginia and DEP's programs and initiatives. Any suggestions or comments for improving this report are welcomed.

John A. Benedict, Director

Charleston Air Quality

1981
On a bad day

2011
On a good day

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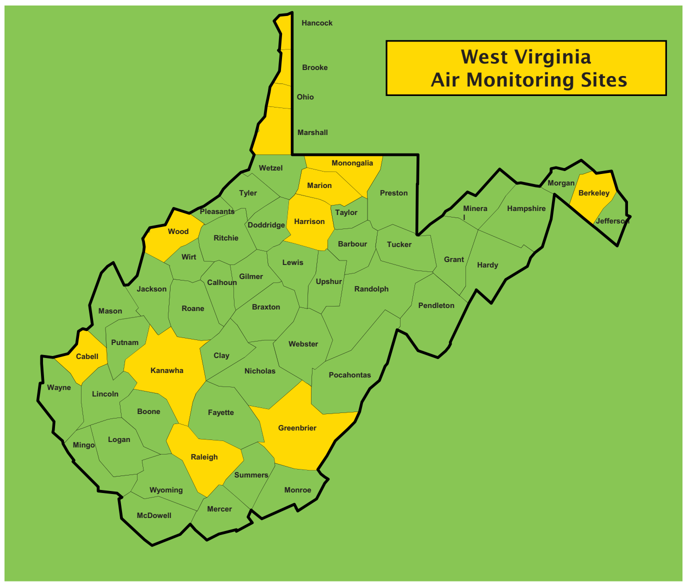
National Ambient Air Quality Standards

Criteria Pollutants

The Clean Air Act, which was amended in 1990, requires that the EPA set National Ambient Air Quality Standards (NAAQS) for pollutants considered to be harmful to public health and the environment. Two kinds of standards were established for acceptable concentrations of specific pollutants in the ambient (outdoor) air. Primary standards set limits to protect public health, including the health of sensitive populations, such as children, the elderly and those with asthma. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation and buildings.



Six principal pollutants currently have NAAQS: ground-level ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2) and lead (Pb). These are commonly called the criteria pollutants.

Health effects of air pollution vary greatly, depending on the exposure level, duration and pollutant. The air quality standard is expressed as an average concentration over a specific time period (an hour, a day or a year) to account for the fact that the concentration of a pollutant in the air varies over time. The concentration is expressed in parts per million (ppm) or micrograms of pollutant per cubic meter of air ($\mu g/m^3$). The standard also specifies whether the limit applies to an annual average concentration, a specific percentile, or a number of times the level can be exceeded during the calendar year.

The EPA must conduct periodic reviews to determine whether the standards should be revised. For example, in 2010, the EPA finalized two sets of ambient air quality standards: NO_2 and SO_2. The agency set a shorter averaging time for NO_2, which is more protective than the previous annual standard, particularly near major roads. The EPA also finalized a shorter averaging time for SO_2, to provide better protection from short-term exposure than the previous 24-hour and annual standards. Both revised standards aim to provide a higher margin of safety to the population at large and to better protect sensitive groups.

West Virginia maintains a statewide network of monitoring stations as shown in Appendix A, page 36. The network monitors the air quality. If the air quality fails to meet any of the NAAQS, the EPA designates the region as a nonattainment area. The DAQ is then required to develop a state implementation plan to achieve and maintain air quality standards in that area. State implementation plans must be approved by the EPA.

Ozone Standard Highlights

The EPA periodically reviews national air quality standards. The agency strengthens them if needed to adequately protect human health, including sensitive groups such as children. West Virginia has made significant progress in meeting previous federal ozone and particulate standards. However, the EPA tightened the ozone standard in May 2008 by lowering it to 0.075 parts per million (three year average) and specifying the precision to three decimal places. Effectively this represented a 10.7 percent reduction of ozone, which the EPA believes will lead to a significant decrease in bronchitis, aggravated asthma and other respiratory problems. Other expected benefits include a reduction in non-fatal heart attacks and decreases in premature death.

Based on the most recent 2008-2010 ozone data, all of West Virginia meets the existing 0.075 ppm standard. In September 2009, though, the EPA announced that it would reconsider that primary standard (2008 Ozone) as well as review the related secondary standard associated with human welfare. New standards are expected to be more stringent than the present ones. The EPA planned to finalize those standards in August 2010, but twice delayed their release, which is now set for July 2011. The agency is considering a range of 0.060 to 0.070 ppm for the primary standard. Several metropolitan areas in the State would likely have difficulty meeting such a standard, based on historical data. The Clean Air Act generally gives states three years to develop a plan, including federally-enforceable emission reductions, to bring any violating areas into attainment.

$PM_{2.5}$ Standard Highlights

West Virginia has also made significant improvements in meeting the annual 1997 $PM_{2.5}$ standard. In 2005, the EPA designated six areas within the state as nonattainment for this pollutant. The areas Include:

- Charleston (Kanawha and Putnam counties);
- Huntington (Cabell and Wayne counties and the Graham Tax District of Mason County);
- Martinsburg (Berkeley County);
- Weirton (Brooke and Hancock counties);
- Wheeling (Marshall and Ohio counties); and
- Parkersburg (Wood County and the Grant Tax District of Pleasants County).

$PM_{2.5}$ concentrations have generally declined in all these areas. Based on the most recent 2008-2010 data, all these areas now monitor attainment of the annual standard. The improvement may primarily be attributed to emission reductions from several federal and state programs. For example, the NO_x and SO_2 reductions made by coal-fired utilities, from early implementation of the Clean Air Interstate Rule that West Virginia adopted, appear to have substantially contributed to the lower $PM_{2.5}$ concentrations. Atmospheric modeling conducted with a consortium of southeast states indicates that the emission reductions may be largely credited for the improved air quality.

As mentioned in last year's report, the EPA strengthened the 24-hour fine particle standard in December 2006 from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. Based on the most recent available data at the time of designation in November 2009, the EPA designated the Charleston area and the Weirton area as nonattainment of the 2006 $PM_{2.5}$ NAAQS. Nevertheless, Charleston did show a subsequent improvement and monitored compliance with the standard for the period 2007-2009. Further, both areas meet the 24-hour standard for the period 2008-2010. However, the areas will remain as nonattainment until a maintenance plan can be developed showing that the standard will be maintained for at least 10 years.

These 24-hour designations are considered separate from the annual standard and have independent plans and attainment schedules.

SO_2 Standard Highlights

In June 2010, the EPA finalized revisions to the National Ambient Air Quality Standards for SO_2. The EPA revised the primary SO_2 standard, designed to protect public health, to a level of 75 parts per billion (ppb) measured over a 1-hour period. The previous primary standards were 140 ppb measured over 24-hours and 30 ppb averaged over an entire year, which are being revoked. The EPA also adopted a new "form" of the standard (based on the 3-year average of the 99th percentile) to determine compliance with the new NAAQS.

Current scientific evidence links health effects with short-term exposure to SO_2 ranging from 5 minutes to 24-hours. Adverse respiratory effects include narrowing of the airways, which can cause difficulty breathing (bronchoconstriction) and increased asthma symptoms. These effects are particularly important for asthmatics during periods of faster or deeper breathing (e.g., while exercising or playing). Studies also show an association between short term SO_2 exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly and asthmatics.

SO_2 can also react with other compounds in the atmosphere to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. The EPA's NAAQS for particulate matter are designed to provide protection against exposures that cause these health effects.

The EPA is not revising the secondary SO_2 NAAQS, set to protect public welfare (including effects on soil, water, visibility, wildlife, crops, vegetation, national monuments and buildings). The EPA is assessing the need for changes to the secondary standard under a separate review for both NO_2 and SO_2.

In addition, the EPA adopted changes to the air monitoring and reporting requirements for SO_2. The EPA anticipates that the proposed new 1-hour standard would continue to prevent SO_2 concentrations from exceeding the current 24-hour and annual health based standards. Additional information regarding SO_2 may be found at www.epa.gov/air/sulfurdioxide/.

In the final rule, the EPA is requiring fewer monitors than proposed, because the agency plans to use a hybrid approach, combining air quality modeling and monitoring to determine compliance with the new SO_2 health standard. The EPA plans to use refined dispersion modeling to determine if areas with sources that have the potential to cause or contribute to a violation of the new SO_2 standard can comply with the standard. Dispersion modeling simulates how air pollutants spread throughout the atmosphere and is used to estimate the concentration of air pollutants from sources such as industrial plants or highways.

Outreach and Education

The Division of Air Quality continues to develop and implement plans to address pollutants from various sources. Since the State Legislature passed the Air Pollution Control Act of West Virginia in 1961, making West Virginia the 16th state to have a statewide air pollution control statute, most of the effort has been focused on addressing pollutant emissions from various industrial sources. Although efforts will continue on this initiative, the cumulative effects from individual choices has created a need to educate the public regarding their everyday activities, and their impact on air quality and a healthy environment.

Environmental regulations, voluntary programs and cleaner vehicles have contributed to cleaner air for much of the state. The focus has broadened from only industrial sources to include individual responsibility and the impact we each have on our environment. Consumers are driving the market and challenging companies to develop sustainable and "green" products. Schools are starting to integrate classes in environmental science as part of the academic curriculum. With this in mind, an opportunity to develop a public awareness and education program focusing on energy efficiency emerged.

Air quality issues are complex, difficult to explain, and often intangible, except in extreme situations. One message we try to communicate is that renewable and alternative energy use improves air quality. After evaluating our traditional communication methods - paper brochures, posters and static displays, and learning styles, we focused on developing interactive displays in which students, and parents alike, could engage in. A multidisciplinary outreach and education team was formed, bringing together personnel from across all sections and job classifications to develop displays and activities which were eye-catching, entertaining and educational. Since displays to fit our objectives were not commercially available for purchase, our talented staff designed and built our own.

In 2010, several professional and well-designed interactive displays were added for use at outreach events. Funding for the displays comes from the Education and Environment Fund, a depository for enforcement action monies to support environmental education. The displays have been exhibited from one end of the state to the other and never cease to draw the attention of students and curious adults. Exhibits have been set up for a variety of events including DEP Day at the Legislature, Earth Day, Discover Engineering Day, the Environmental Education Conference, Youth Environmental Day, Asthma Awareness, Sustainability Fair, and state and county fairs.

In 2010 new interactive displays developed include:

- **Energy Efficient Window Display**
  The Energy Efficient Window Display illustrates how different types of window glass can save energy. The display includes three glass windows: a single layer, a double layer with argon gas between the two layers, and a double layer glass with low E coating and argon. The windows rotate around a halogen bulb so participants can feel the difference in the amount of heat transmitted when each window passes the bulb.

- **Energy Efficient Roof Display**
  The Roof Color Display was constructed to demonstrate the concepts that color affects heat and light absorption, and insulation blocks heat transfer. Two of

the houses have different colored roofs, one dark and one light. The third house is “two story” and shows the benefit of insulation. Each have a thermometer attached to the front to readily show the temperature difference.

- **Diorama**
  The Wind Turbine Diorama is a scenic representation of some of the renewable energy sources available in West Virginia. The diorama includes a spinning wind turbine (with a flashing red LED light), LED lights in the house, and a solar panel to illustrate pedestal-mounted solar panels instead of roof mounted ones.

The DAQ’s Small Business Assistance Program (SBAP) again produced and distributed the annual Dry Cleaner Compliance Calendar to assist this small business community. The calendar has the monitoring, record-keeping and reporting requirements mandated by federal rules all in one handy document. This effort has been praised by both the industry and the DAQ Enforcement Section.

The SBAP also followed up on a previous outreach to miscellaneous metal parts, autobody coaters and metal fabrication shops that were affected by new federal rules. The second phase of this area source outreach consisted of the compilation and mailing of informational pamplets specific to the autobody and miscellaneous metal part coating sectors. A poster was also developed outlining the best management practices outlined inthe new rule, dealing with metal fabrication shops. Between these three outreach tools, over 450 potentially affected facilities were included in this targeted outreach.

Ozone (O_3)

PRIMARY NAAQS:	Maximum 8-hour average concentration of 0.075 ppm based on 3-year average of the annual fourth highest daily maximum 8-hour averages.
SECONDARY NAAQS:	Same as primary standard.

Ozone is a highly reactive gaseous molecule that occurs in two levels of the atmosphere — in the Earth's upper atmosphere and at ground-level. Ozone can be "good" or "bad" for your health and the environment, depending on its location in the atmosphere.

Good ozone, or the naturally occurring stratospheric ozone (commonly referred to as the ozone layer), exists in the upper portion of the atmosphere (from about 10 to 30 miles) and protects life on Earth from the sun's harmful ultraviolet rays. This protective ozone layer is affected by man-made chemicals. Even though we have reduced or eliminated the use of many of these ozone-depleting substances, their past use still affects the thinning of this layer today. Ozone depletion can cause increased amounts of ultraviolet radiation to reach the Earth, which can lead to more cases of skin cancer, cataracts and impaired immune systems. Monitoring and observation of the good ozone is accomplished using satellite measurements, which is much more technical and involved than our state monitoring system.

The ozone monitors the DAQ maintains and operates measure the ground-level, or bad, ozone pollution. This ozone can be a hazard rather than a benefit. It is a colorless gas which is not emitted directly into the atmosphere from sources but is formed by complex chemical reactions involving two pollutants — nitrogen oxides and volatile organic compounds — in the presence of sunlight. Nitrogen oxides are formed as a by-product of combustion from motor vehicles, boilers, incinerators and power plants. Sources of volatile organic compounds include motor vehicle exhaust, dry cleaning, paint solvents and evaporation of gasoline from storage and transfer facilities.

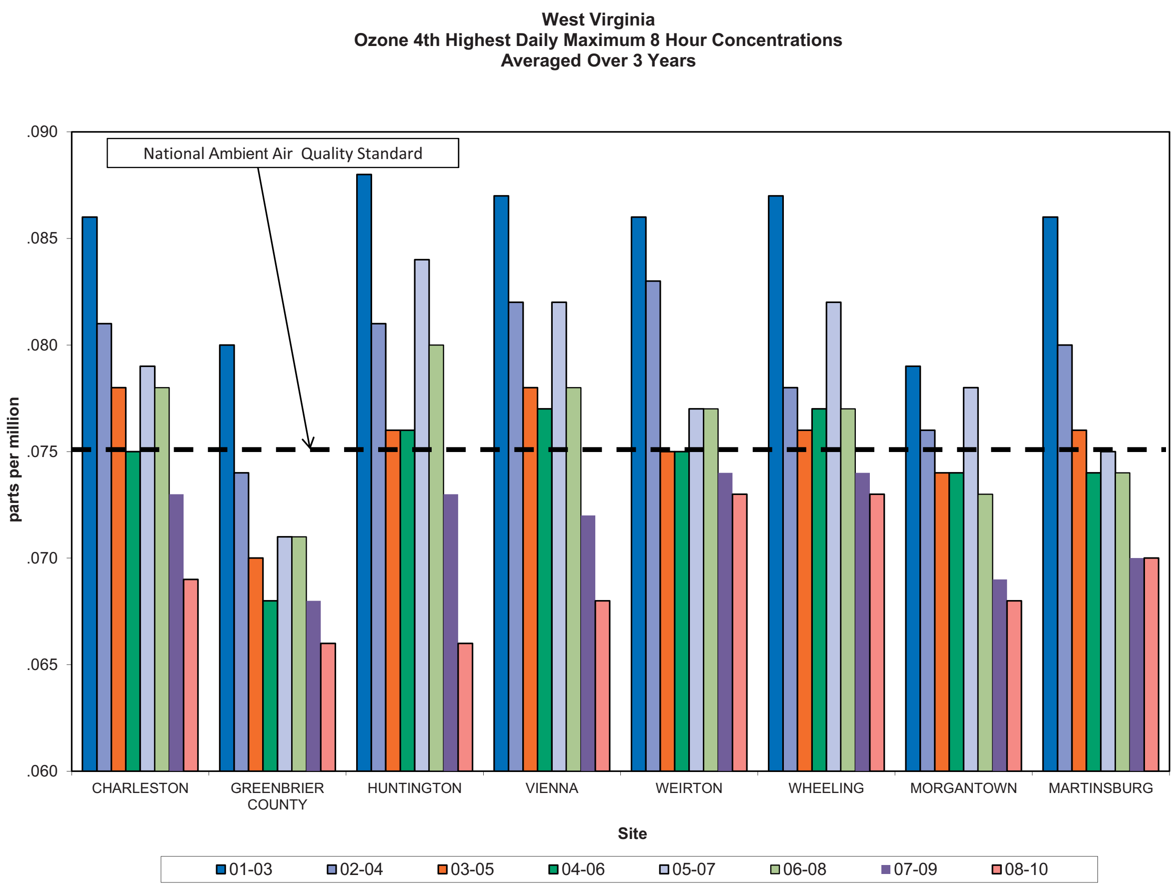
Bad ozone is of most concern during the summer months because strong sunlight and hot weather can result in harmful ozone concentrations in the air we breathe. Ozone formation usually peaks when sunlight is strongest during afternoon hours. Many urban and suburban areas throughout the United States have high levels of bad ozone. Many rural areas of the country are also subject to high ozone levels as winds carry emissions hundreds of miles away from their original sources.

Ground-level ozone is a strong irritant to the eyes and upper respiratory system and can be particularly harmful to people with asthma and circulatory problems. Ground-level ozone also causes damage to trees and vegetation and is the primary ingredient in smog.

Ozone levels fluctuate depending on weather conditions. In West Virginia, the ozone monitoring season runs from April 1 to October 31. Hot, dry weather and stagnant air favor the formation of ozone and the greatest number of days with exceedences typically occurs during the hottest and driest summers. Ozone levels usually begin to rise in the late morning hours and may reach their most unhealthy levels during the evening rush hour. In most areas, ozone levels decrease after sunset. However, if there is little movement of air masses and the heat continues, high ozone levels can continue over several days. West Virginia's mountainous topography can add to ozone levels by capturing air in the valleys, limiting air dispersion.

Ground-level ozone is one of West Virginia's recurring air pollution problems. Controlling ozone is a complex problem due to the variety of sources for nitrogen oxides and VOCs and the long-distance transport of ozone and its precursors. A three-year summary of monitored ozone data is located below.

Breathing air containing ozone can reduce lung function and increase respiratory symptoms, thereby aggravating asthma or other respiratory conditions. Ozone exposure also has been associated with increased susceptibility to respiratory infections, medication use by asthmatics, doctor and emergency department visits, and hospital admissions for individuals with respiratory disease. According to EPA, Ozone exposure may also contribute to premature death, especially in people with heart and lung disease.



Particulate Matter (PM_{10})

Less than 10 microns in diameter

Particulate matter (PM) consists of the solid particles and liquid droplets found in the air. These particles and droplets come in a wide range of sizes. Individually, they are invisible to the naked eye. Collectively, however, the particles can appear as clouds or a fog-like haze. Particulates result from many different sources including wind-blown dust, wood-burning stoves, leaf burning, vehicle exhaust, utility plants, incinerators, construction, vehicles traveling on paved and unpaved roads, materials handling and crushing, as well as grinding operations. Water sprays and other dust suppressants are often used to reduce PM emissions.

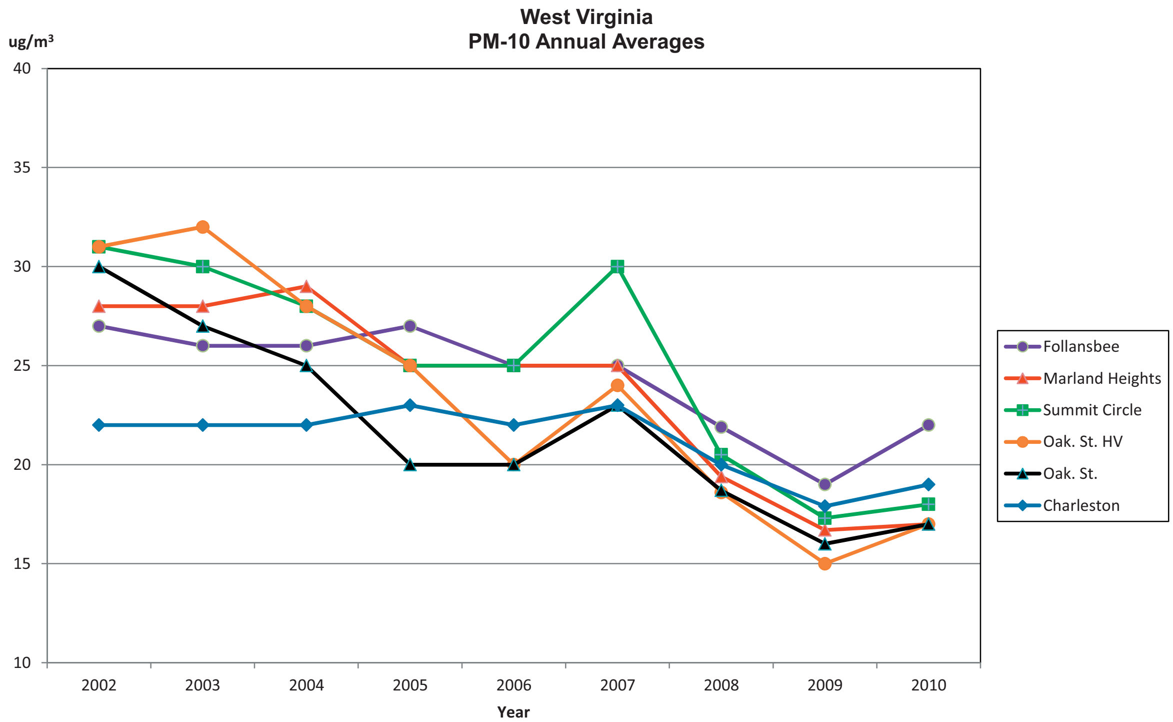
PRIMARY NAAQS:	24-hour average not to exceed 150 µg/m^3. Average number of expected exceedances per year not to exceed 1.0.
SECONDARY NAAQS:	Same as primary standard.

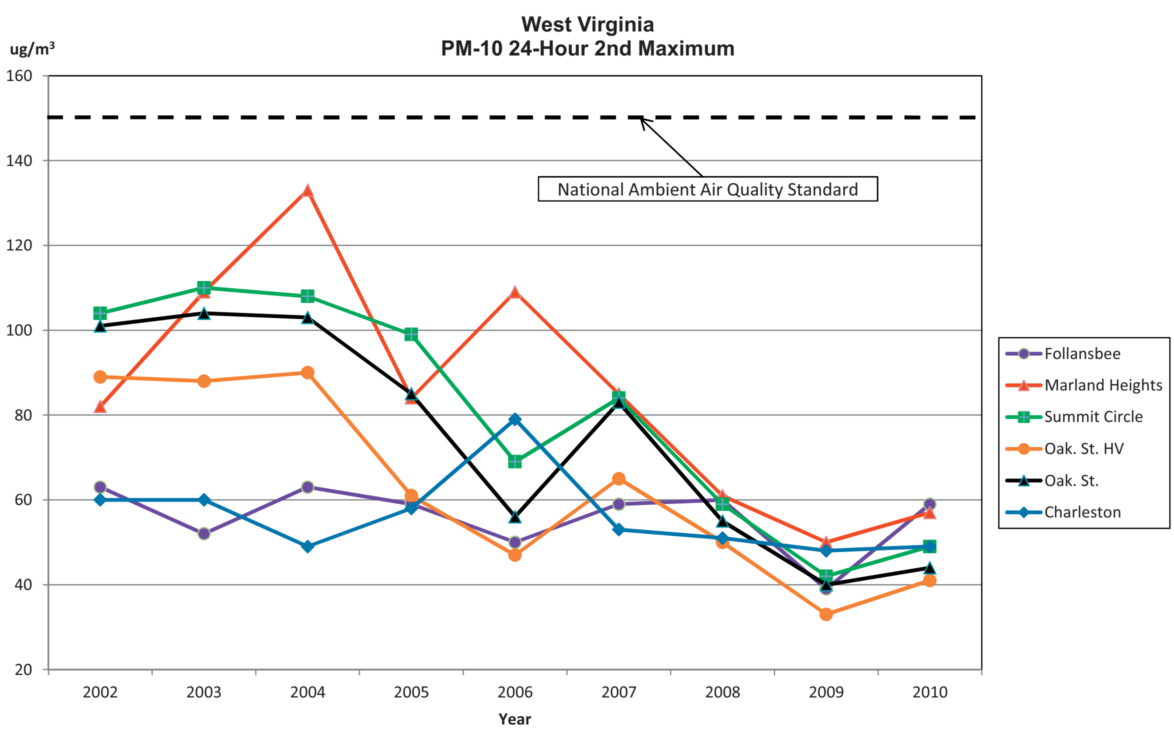
The environmental and health effects of PM can vary depending on the size of the particles. Larger particles rapidly settle out of the air due to gravity and pose a limited health risk. Particles between 10 and 50 micrometers rarely penetrate deeply into the human respiratory system, but are trapped and removed by the body's natural defenses. Smaller particles are less heavy, stay in the air longer and travel farther, contributing to haze. These particles also can be inhaled more deeply into human lungs, increasing the potential for severe health effects. In addition, smaller particles generally include more toxic substances than larger particles.

Because of these differences, the EPA maintains two separate ambient air quality standards for particulate matter. One standard addresses PM_{10} particles that are relatively coarse, but equal to or less than 10 micrometers in diameter. The other standard addresses levels of fine particulate matter (known as $PM_{2.5}$), which contains particles equal to or less than 2.5 micrometers in diameter. In comparison, a human hair is about 70 micrometers in diameter. Adverse health effects have been associated with exposures to $PM_{2.5}$ over both short periods (such as a day) and longer periods (a year or more). Particles in the PM_{10} range are small enough to evade the body's natural defense systems and penetrate into the lungs, where tissue is damaged and the immune system is weakened. As a result of research on particulate matter, the EPA adopted a PM_{10} standard in 1987, replacing a previous total suspended particulate standard. In a 2006 revision, the EPA retained the current 24-hour PM_{10} ambient air quality standard. However, the EPA revoked the annual standard, meaning the standard is no longer in effect. The agency has determined that the short-term 24-hour standard makes the annual standard unnecessary.

The DAQ's monitoring network measures PM_{10} at six sites in four counties across West Virginia. PM_{10} is monitored at a sixth site in Ohio county, to provide data for the air quality index. Monitors are jointly located at Oak Street in Weirton for quality assurance and quality control purposes. All monitoring sites have shown consistent averaged values that are well below the current 24-hour and the former annual NAAQS.

A historical summary of monitored PM_{10} data is located on page 9.





Particulate Matter

PM_{10}

Particulate Matter ($PM_{2.5}$)

Less than 2.5 microns in diameter

Medical and scientific research on the health effects of particulate matter continued after the adoption of the PM_{10} standard. As a result of further research, it was determined that very fine particles in the 2.5 microns diameter and less size range have the most adverse effects on human health. Discussion of $PM_{2.5}$ standards may sometimes be confusing because separate but overlapping sets of standards were adopted in 1997 and 2006, respectively. Each set has an annual standard and a 24-hour standard. The annual standard is constant but the 24-hour standard differs between the 1997 and 2006 sets. Fourteen $PM_{2.5}$ monitoring sites were operated in West Virginia in 2010. A special filter-weighing laboratory is used to analyze filters from these monitors.

PRIMARY NAAQS:	Annual arithmetic mean not to exceed 15 µg/m^3 (based on a 3-year average). 24-hour concentration 35 µg/m^3. (3-year average of the 98th percentile)
SECONDARY NAAQS:	Same as primary standard.

Based on the 2002-2004 data, the annual $PM_{2.5}$ nonattainment areas, as published by the EPA on April 5, 2005, for the state are shown in the chart on page 11. The rest of the state is considered to be in attainment for the annual $PM_{2.5}$ standard. These identified areas are based upon the 1997 NAAQS for $PM_{2.5}$. A map depicting the areas is also located on page 11. In December 2006, the EPA strengthened the 24-hour fine particle standard from the 1997 level of 65 µg/m^3 to 35 µg/m^3, and retained the current annual fine particle standard at 15 µg/m^3. The EPA issued final designations in November 2009. Except for the Charleston and Weirton areas, the entire state was designated attainment/unclassifiable. A historical summary of monitored $PM_{2.5}$ data is located on page 12. Notably, $PM_{2.5}$ concentrations have improved such that during 2008-2010, the entire state continues to attain the annual standard. Further, short-term concentrations have also improved such that all monitoring sites, including, Charleston and Weirton, met the 24-hour $PM_{2.5}$ standard for the period 2008-2010. Therefore, all monitoring sites in the state are meeting the applicable $PM_{2.5}$ standards. However, the areas will formally remain designated nonattainment until DAQ develops maintenance plans that ensure attainment for at least 10 years.

The DAQ operates three $PM_{2.5}$ speciation monitors to help determine the chemical makeup of fine particles. The monitors are located at South Charleston, in the Kanawha Valley, at the Guthrie Agricultural Center north of Charleston and at Moundsville in the Northern Panhandle. To accommodate site renovations, the Moundsville speciation monitor was moved to the Wheeling site in September 2009. The monitor will be returned to the Moundsville site once renovations are completed. Samples collected by these monitors are analyzed for anions (particulate sulfate and nitrate), cations (particulate ammonium, sodium and potassium), trace elements, total carbonaceous material and fine particulate mass. An example of the type of data provided by the speciation monitors can be found in Appendix A, pages 40 and 41.

DESIGNATED 2006 $PM_{2.5}$ (24-hour) NONATTAINMENT AREAS

Charleston, W.Va. MSA*
- including Kanawha and Putnam counties, W.Va.

Steubenville, Ohio, Weirton, W.Va. MSA*
- including Brooke and Hancock counties, W.Va.

DESIGNATED 1997 $PM_{2.5}$ (annual) NONATTAINMENT AREAS **

Charleston, W.Va. MSA*
- including Kanawha and Putnam counties, W.Va.

Huntington, W.Va., Ashland, Ky., Ironton, Ohio MSA*
- Including Cabell and Wayne and part of Mason counties, W.Va.

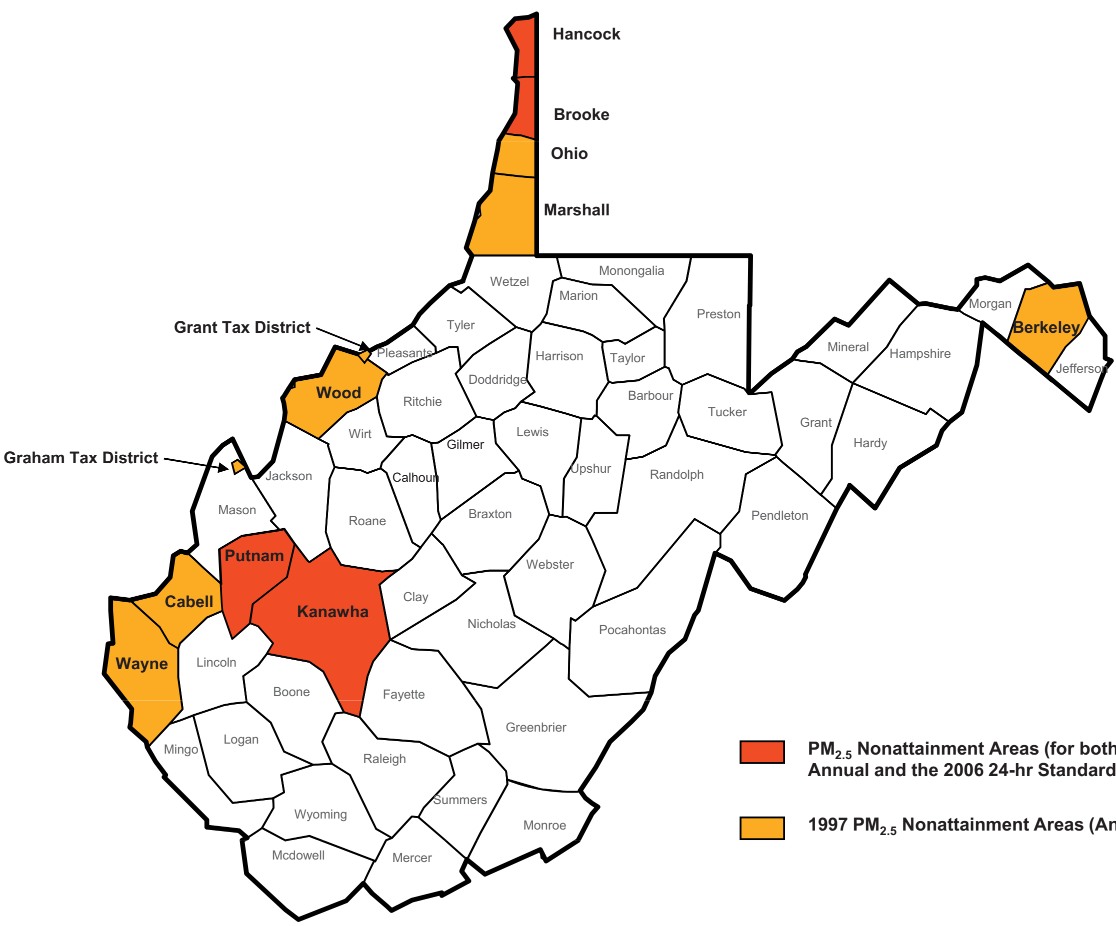
Parkersburg, W.Va., Marietta, Ohio MSA*
- including Wood and part of Pleasants counties, W.Va.

Steubenville, Ohio, Weirton, W.Va. MSA*
- including Brooke and Hancock counties, W.Va.

Wheeling, W.Va., Ohio MSA*
- including Ohio and Marshall counties, W.Va. and Belmont County, Ohio

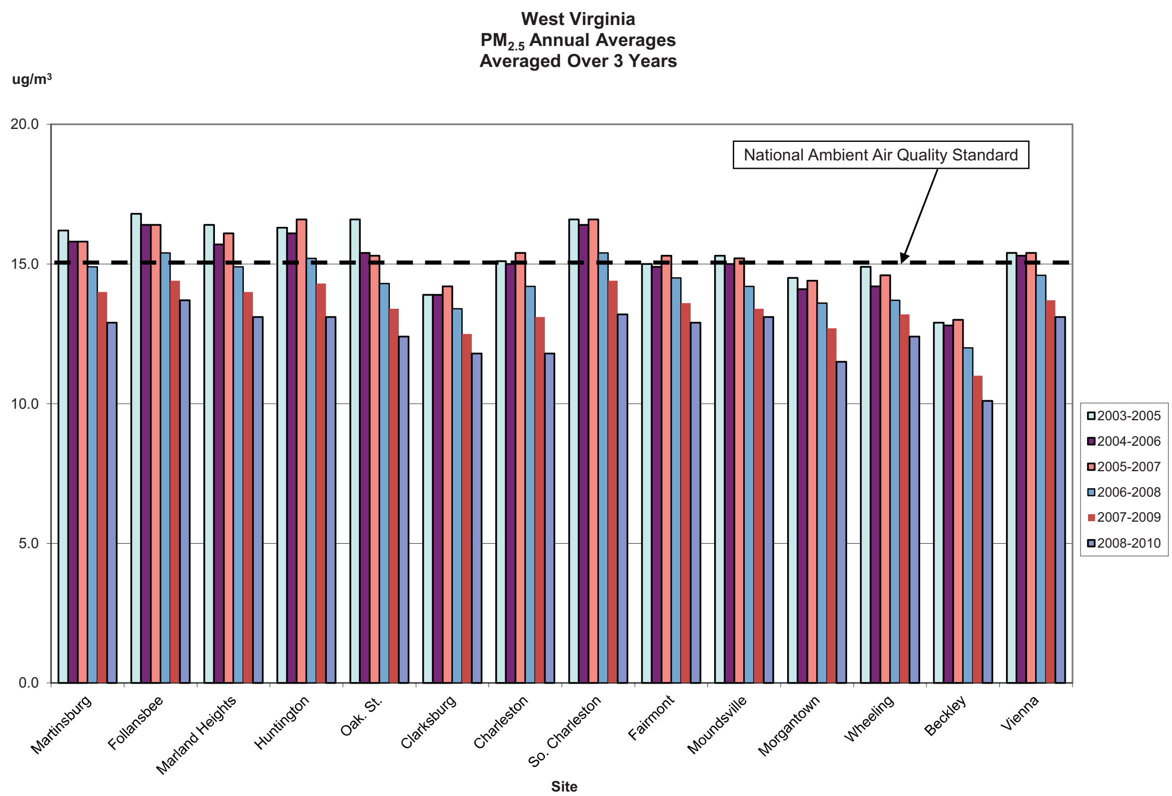
W.Va. Eastern Panhandle
- including Berkeley County, W.Va.

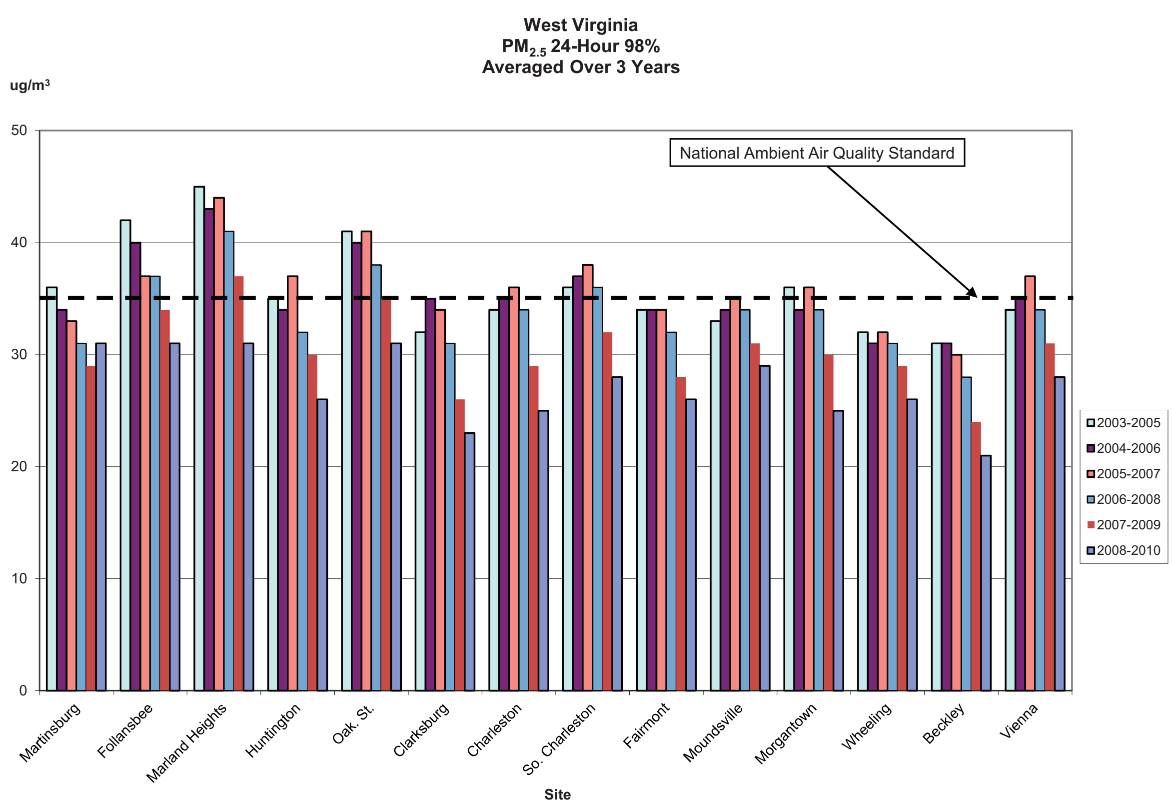
*Metropolitan Statistical Area
**1997 Annual $PM_{2.5}$ Standard



$PM_{2.5}$ Nonattainment Areas (for both the 1997 Annual and the 2006 24-hr Standards)

1997 $PM_{2.5}$ Nonattainment Areas (Annual)





Particulate Matter

$PM_{2.5}$

Sulfur Dioxide (SO_2)

Sulfur dioxide is a colorless gas that has a pungent odor. SO_2 can bind to dust particles and aerosols in the atmosphere, traveling long distances on prevailing winds. It can also combine with moisture in the atmosphere to form sulfuric acid (H_2SO_4), which is a component of acid precipitation (also known as acid rain) that causes acidification of soil and water and the erosion of building surfaces. Sulfur compounds contribute to visibility degradation in many areas and can damage the foliage of trees and agricultural crops.

PRIMARY NAAQS:	1-hour concentration 75 ppb (3-year average 99th percentile)
SECONDARY NAAQS:	3-hour concentration not to exceed 0.50 ppm more than once per year.

The main sources of SO_2 are combustion of coal and oil, refineries, smelters and industrial boilers. Nationally, two-thirds of all SO_2 emissions are from power plants.

SO_2 is an irritant that can interfere with normal breathing functions even at low concentration levels. It also aggravates pre-existing respiratory, cardiovascular and pulmonary diseases.

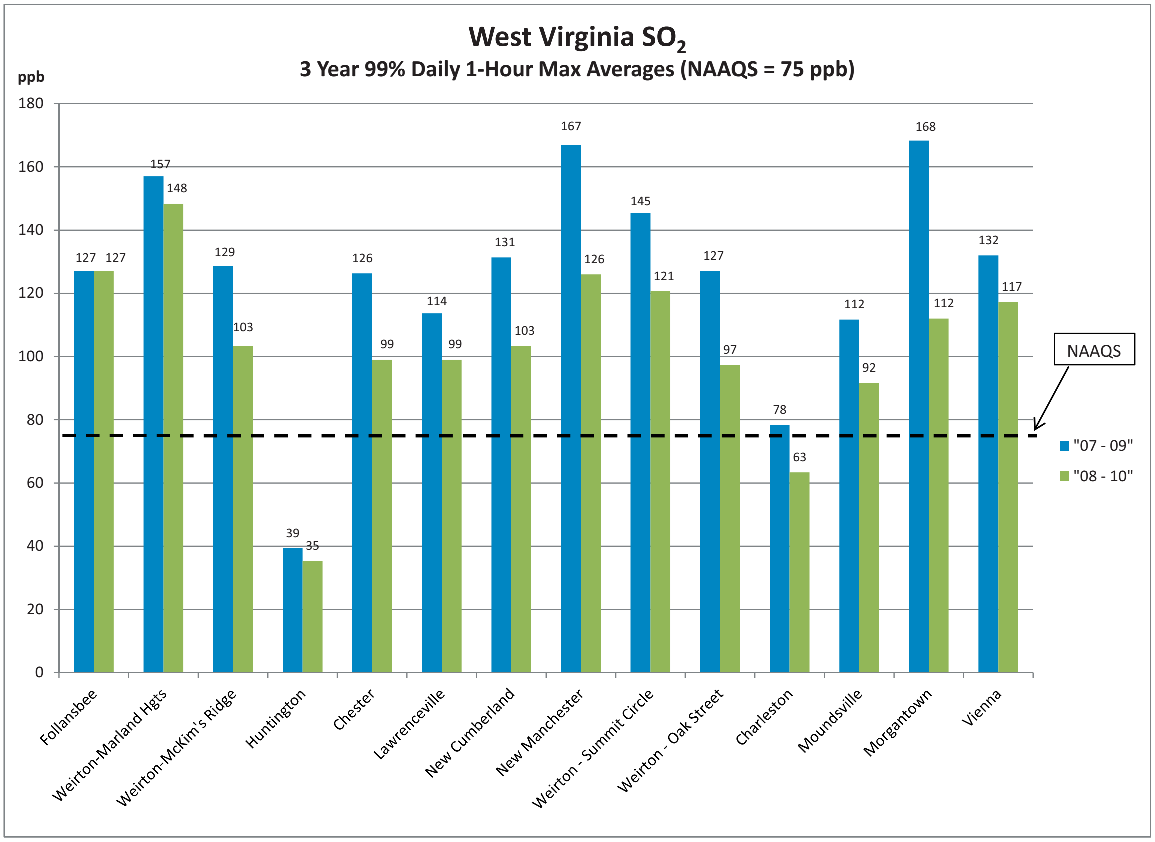
As noted in this document's *2010 Highlights*, the EPA finalized revisions to NAAQS for SO_2 in June 2010. The EPA revised the primary SO_2 standard, designed to protect public health, to 75 parts per billion (ppb) measured over a 1-hour period. The previous primary standards were 140 ppb measured over 24-hours and 30 ppb averaged over an entire year, which are being revoked. The EPA also adopted a new "form" of the standard (based on the 3-year average of the 99th percentile) to determine compliance with the new NAAQS. Current scientific evidence links health effects with short-term exposure to SO_2 ranging from 5 minutes to 24-hours.

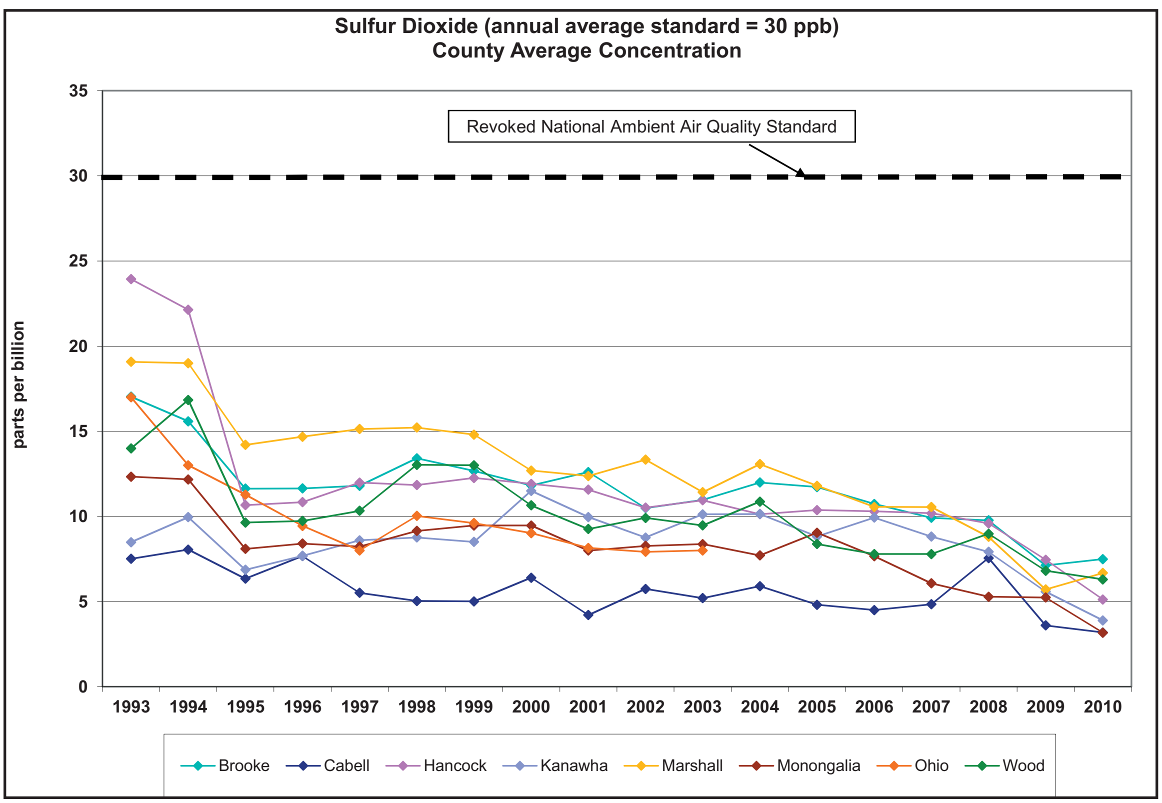
Adverse respiratory effects include narrowing of the airways which can cause difficulty breathing (bronchoconstriction) and asthma symptoms. These effects are particularly important for asthmatics during periods of faster or deeper breathing (e.g. while exercising or playing). Studies also show an association between short-term SO_2 exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly and asthmatics.

SO_2 can also react with other compounds in the atmosphere to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. We are introducing a new chart in this report that shows how the monitoring sites compare to the new 1-hour SO_2 standard. The 1-hour standard is a new short term averaging period for SO_2 monitoring. While air quality has continued to improve over the years and the 24-hour, annual and 3-hour SO_2 values have declined, the data shows that most sites are now above the more stringent 1-hour standard.

The EPA is assessing the need for changes to the secondary standard under a separate review for both NO_2 and SO_2.

A historical summary of monitored SO_2 data is located on page 14.





Sulfur Dioxide SO_2

Carbon Monoxide (CO)

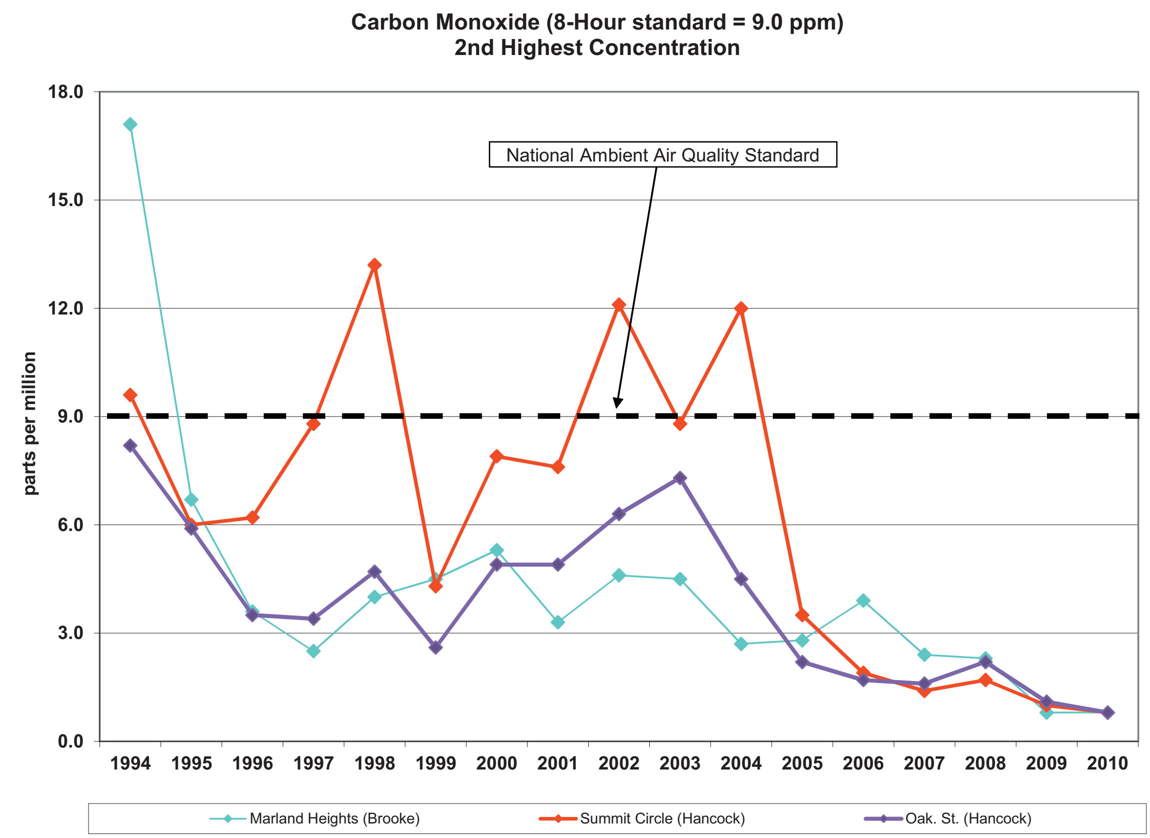
Carbon monoxide is an odorless, colorless, poisonous gas produced by incomplete combustion of fuels. The primary source of carbon monoxide is the exhaust from motor vehicles, which includes highway and non-road vehicles, such as construction equipment. Concentrations are usually highest along heavily traveled highways, but industrial sources can also cause levels to rise. Other sources include incinerators, kerosene and wood stoves, furnaces and some industrial processes.

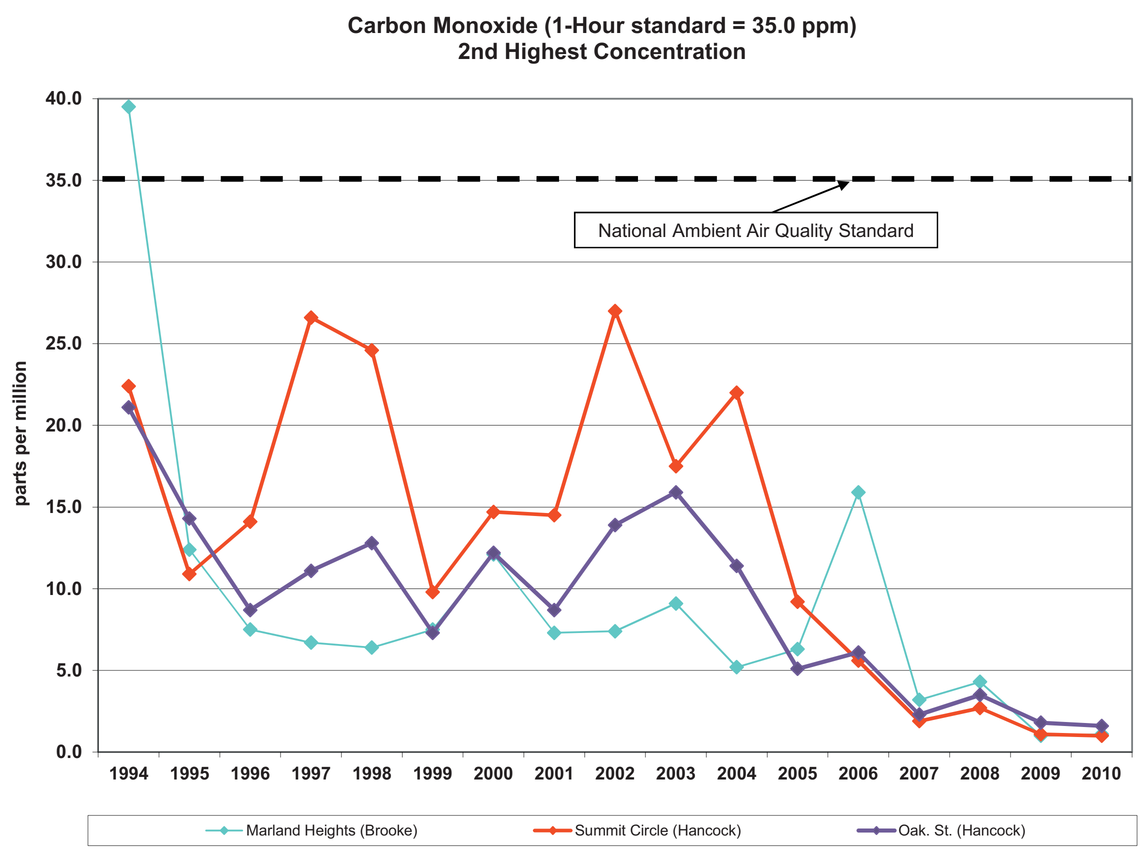
PRIMARY NAAQS:	8-hour average not to exceed 9 ppm more than once per year. 1-hour average not to exceed 35 ppm more than once per year.
SECONDARY NAAQS:	None.

The main health effect of CO is its tendency to reduce the oxygen carrying-capacity of the blood. Depending on the level of exposure, CO can cause fatigue, headaches, and impaired vision and reflexes at moderate concentrations. Unconsciousness and even death may occur at high concentrations. The severity of the effects is related to the length of exposure and concentration level of CO.

In most areas, CO levels have declined well below the standard primarily due to improved controls on motor vehicles. In the past decade, monitoring sites that reported continuously low levels were removed. Two Hancock County and one Brooke County monitoring sites measured carbon monoxide levels through 2010. In 2010, all sites reported levels below the 1-hour and 8-hour standards.

An historical summary of monitored CO data is located on page 16.





Carbon Monoxide

CO

Lead (Pb)

On October 15, 2008, the EPA substantially strengthened the NAAQS for lead. The revised standards are 10 times tighter than the previous standards and will improve health protection for at-risk groups, especially children.

The EPA has revised the level of the primary (health-based) standard from 1.5 micrograms per cubic meter ($\mu g/m^3$) to 0.15 $\mu g/m^3$, measured as total suspended particles (TSP). The EPA has revised the secondary standard (welfare-based) to be identical in all respects to the primary standard.

In conjunction with strengthening the lead NAAQS, the EPA is improving the existing lead monitoring network by requiring monitors to be placed in areas with sources, such as industrial facilities, that emit one half ton or more or at airports that emit 1 ton or more of lead. Monitoring will also be required at NCore sites in urban areas with more than 500,000 people to gather information on the general population's exposure to lead in air and ensure protection against sources of airborne dust containing lead.

The EPA changed the calculation method for the averaging time to use a "rolling" three month period with a maximum (not-to-be-exceeded) form, evaluated over a three-year period. This replaces the current approach of using calendar quarters. A rolling three-month average yields 12 three-month periods associated with a given year, not just the four calendar quarters within that year.

The EPA will require state and local monitoring agencies to conduct monitoring, taking into account lead sources that are expected to or have been shown to exceed the standards. At a minimum, monitors must be placed in areas with sources of lead emissions greater than or equal to half ton or more per year, to measure the maximum concentration.

Lead that is emitted into the air can be inhaled or, after it settles out in the air, can be ingested. Ingestion of lead that has settled onto surfaces is the main route of human exposure to lead originally released into the air.

Once in the body, lead is rapidly absorbed into the bloodstream and results in a broad range of adverse health effects.

Children are most vulnerable to the damaging effects of lead because they are more likely to ingest lead due to hand-to-mouth activity and their rapidly developing bodies. Exposures to low levels of lead early in life have been linked to effects on IQ, learning, memory and behavior. There is no known safe level of lead in the body.

Nitrogen Dioxide
NO_2

On January 22, 2010, the EPA strengthened the health-based National Ambient Air Quality Standard for nitrogen dioxide (NO_2). The new standard will protect public health, including the health of sensitive populations people with asthma, children and the elderly.

The EPA is setting a new 1-hour NO_2 standard at the level of 100 parts per billion (ppb). This level defines the maximum allowable concentration anywhere in an area. It will protect against adverse health effects associated with short-term exposure to NO_2, including respiratory effects that can result in admission to a hospital. In addition to establishing an average time and level, EPA also is setting a new "form" for the standard. The form is the air quality statistic used to determine if an area meets the standard. The form for the 1-hour NO_2 standard, is the 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations. The EPA is also retaining, with no change, the current annual average NO_2 standard of 53 ppb.

This suite of standards will protect public health by limiting people's exposures to short-term peak concentrations of NO_2
- which primarily occur near major roads,
- and by limiting community-wide NO_2 concentrations to levels below those that have been linked to respiratory-related emergency department visits and hospital admissions in the United States.

The EPA's NAAQS for NO_2 is designed to protect against exposure to the entire group of nitrogen oxides (NO_x). NO_2 is the component of greatest concern and is used as the indicator for the larger group of NO_x. The sum of nitric oxide (NO) and NO_2 is commonly called NO_x. Other nitrogen oxides include nitrous oxide and nitric acid.

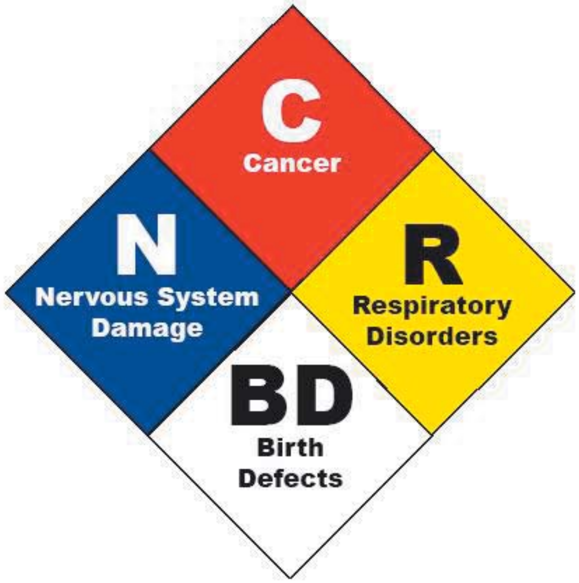
Emissions that lead to the formation of NO_2 generally also lead to the formation of other NO_x. Control measures that reduce NO_2 can generally be expected to reduce population exposures to all gaseous NO_x. This may have the co-benefit of reducing the formation of ozone and fine particles both of which pose significant public health threats:

- NO_x react with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis and can aggravate existing heart disease, leading to increased hospital admissions and premature death. The EPA's NAAQS for particulate matter (PM) are designed to provide protection against these health effects.
- NO_x reacts with volatile organic compounds to form ozone. Children, the elderly, people with lung diseases such as asthma, and people who work or exercise outside are at risk for adverse health effects from ozone. These effects include reduced lung function and increased respiratory symptoms, more respiratory-related emergency department visits and hospital admissions, and an increased risk of premature death from heart or lung disease. The EPA's NAAQS for ozone are designed to provide protection against these health effects.

Criteria Pollutants

Pollutant	Sources	Health Effects	Environmental Effects
Carbon Monoxide (CO) Colorless, odorless poisonous gas, formed when carbon in fuels is not burned completely	Burning of gasoline, wood, natural gas, coal, oil, etc. (motor vehicle exhaust, industrial processes, fuel combustion)	Reduces oxygen delivery to the body's organs and tissues, causes visual impairment, and reduces work capacity, manual dexterity, and learning ability	A precursor to ozone and a useful tracer of combustion-derived pollutants
Lead (Pb) Solid metallic element	Aviation fuel, paint, metal smelters, battery plants, steel plants	May cause anemia, kidney disease, reproductive disorders, behavioral disorders, neurological impairments (seizures, mental retardation)	Harmful to wildlife
Nitrogen Dioxide (NO_2) From the nitrogen oxide family, forms when fuel is burned at high temperatures	Burning of gasoline, natural gas, coal, oil, etc. (diesel trucks, wood stoves, power plants, cars)	Irritates the lungs, lowers resistance to respiratory infections, increases incidence of acute respiratory illness in children	Contributes to acid rain and eutrophication (a reduced amount of oxygen) in coastal waters, which is destructive to fish and other animal life
Ozone (O_3) Chemical reaction of nitrogen oxides and volatile organic compound emissions (primary component of smog)	Gasoline vapors, chemical solvents, combustion products of various fuels, consumer products	Reduces lung function, induces respiratory inflammation, asthma, chest pain, coughing, nausea, pulmonary congestion	Damage to plants and trees, reduced visibility due to smog, permanent structural damage to the lungs of animals
Particulate Matter (PM_{10}, $PM_{2.5}$) Solid or liquid particles found in the air, originates from a variety of mobile and stationary sources	Burning of wood, diesel, and other fuels (diesel trucks, wood stoves, power plants), agriculture (plowing and burning of fields), unpaved roads	Effects on breathing and respiratory system, damage to lung tissue, nose and throat irritation, cancer, premature death	Reduced visibility, damage to manmade materials when acidic
Sulfur Dioxide (SO_2) From the sulfur oxide family, forms when fuel containing sulfur is burned	Burning of coal and oil, diesel engines, industrial processes (metal smelting, paper, oil refining)	Effects on breathing, respiratory illness, alterations in pulmonary defenses, aggravation of existing cardiovascular disease	Damage to the foliage of trees and agricultural crops, acidification of lakes and streams, accelerated corrosion of buildings and monuments, reduced visibility

Air Toxics

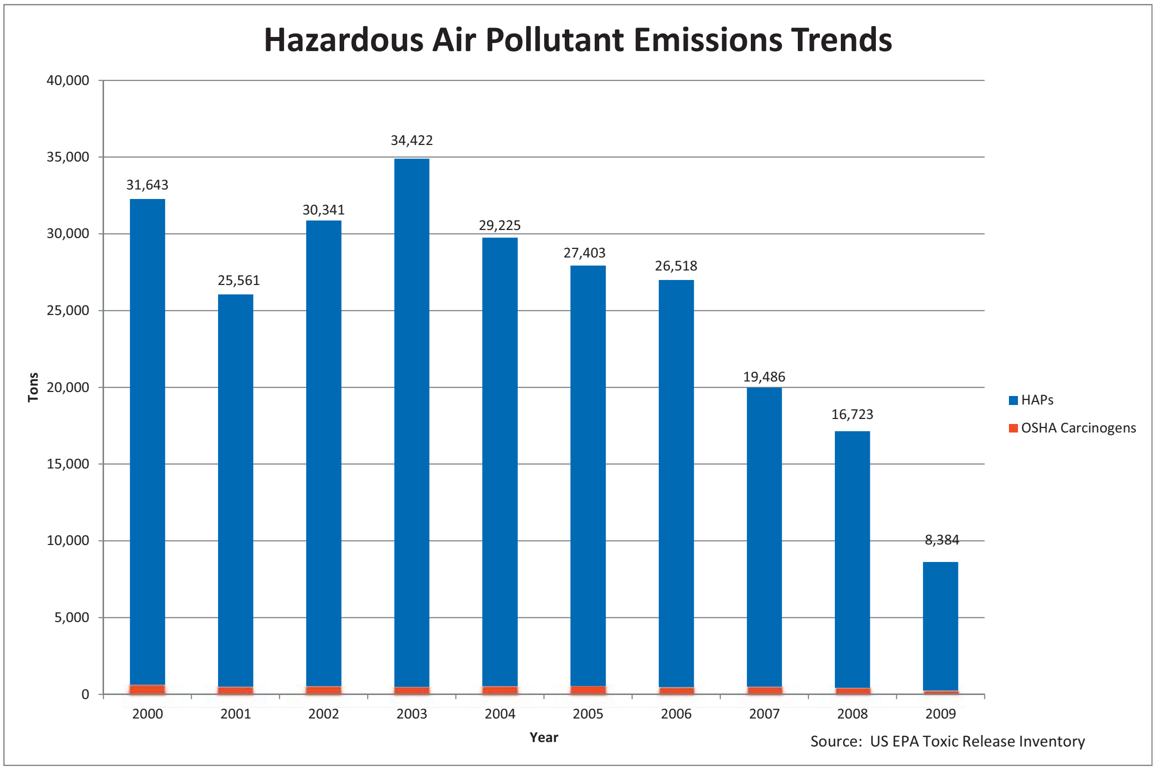


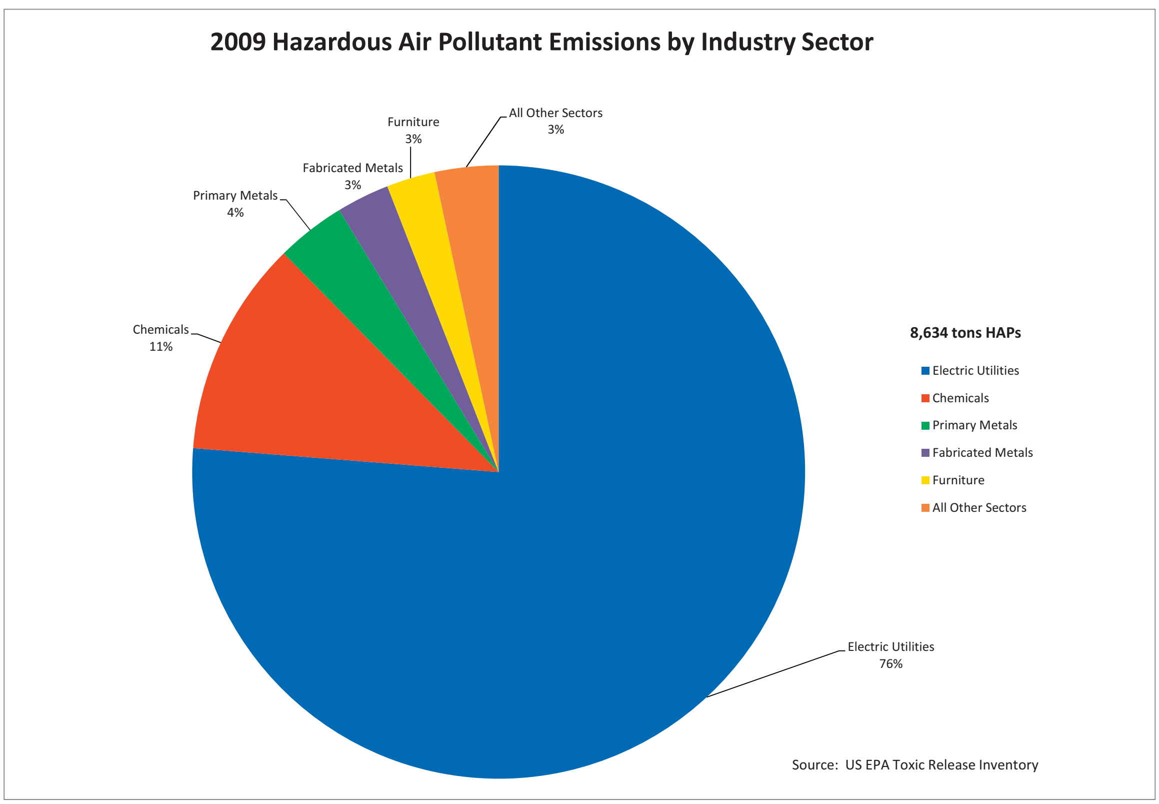
Continued implementation of the federal maximum achievable control technology (MACT) standards and other programs has been an on-going effort. Implementation of these programs has helped reduce emissions of air toxics in West Virginia. MACT standards, established by the EPA, regulate emissions of the 187 Hazardous Air Pollutants (HAPs) from various industrial sources, such as chemical plants, metallurgical manufacturers, refineries and surface coaters. Some HAPs are carcinogenic and/or have non-cancerous or acute effects; approximately two-thirds of the HAPs are known, probable, or possible human carcinogens. A few HAPs are known to bioaccumulate and bioconcentrate in humans and in the environment. All HAPs are not equivalent to one another in toxicity to humans or the environment.

Since 1993, the EPA has issued nearly 100 MACT standards covering close to 200 categories of large industrial sources. Additionally, there are a number of air toxics standards for smaller facilities, including older standards for dry cleaners, chromium electroplaters, secondary aluminum producers, and newer standards for natural gas transmission facilities with dehydrators, wood preservers, clay ceramics manufacturing, glass manufacturing and chemical manufacturing facilities. More information on air toxics efforts can be found at www.dep.wv.gov/daq and choosing the "air toxics" link.

As shown in the bar chart on page 21, HAPs continue to be reduced as the dates for complying with each of these standards for large and small facilities arrive. As a result, West Virginians can breathe easier as we look forward to enjoying ever cleaner air. Over this period, the number of major sources has remained fairly consistent. The majority of HAP emissions in the state are acid gases, such as hydrogen chloride and hydrogen fluoride, and are primarily generated from the combustion of coal. As shown in the pie chart on page 21, the electric utility sector emits the most HAP emissions into the atmosphere followed by the chemicals and metals sectors. Much of the recent decline in HAPs from 2008 to 2009 is due to reductions of mineral acid emissions at coal-fired electric utilities. The main reasons for the overall reductions in minerals acids in the last year from the electric utilities were changes in the natural variability in the chlorine content of the coal seams, a reduction in electricity production at some of the facilities, and the installation of air pollution control devices at coal-fired power plants.

The EPA periodically performs a national-scale air toxics assessment (NATA) as a screening-level estimate of risk and risk-drivers for health impacts. This analysis relies on dispersion modeling of HAP emissions from large and small stationary sources, on-road and off-road vehicle emissions, and background values. The latest assessment is based on calendar year 2005 data and posted to EPA's website: (www.epa.gov/ttn/atw/natamain/).


Hazardous Air Pollutant Emissions Trends
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Tons
31,643
25,561
30,341
34,422
29,225
27,403
26,518
19,486
16,723
8,384
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year
HAPs
OSHA Carcinogens
Source: US EPA Toxic Release Inventory


2009 Hazardous Air Pollutant Emissions by Industry Sector
Furniture 3%
All Other Sectors 3%
Fabricated Metals 3%
Primary Metals 4%
Chemicals 11%
Electric Utilities 76%
8,634 tons HAPs
Electric Utilities
Chemicals
Primary Metals
Fabricated Metals
Furniture
All Other Sectors
Source: US EPA Toxic Release Inventory

Air Toxics

Air Toxics Monitoring

The DAQ operates a network of air toxics monitors to fulfill a variety of programmatic goals, including periodic special projects in specific areas. The table on page 23 shows a summary of the types of ambient air toxics monitoring sites across the state, as well as denotes the different types of air toxic compounds sampled at them.

The DAQ began to install and operate ambient air toxics monitoring stations in 2005, and now has three sites, which operate in Charleston, Wheeling and Morgantown. These monitors collect samples every sixth day, and provide an idea of what is in the urban air in West Virginia. The samples undergo laboratory analysis for volatile organic compounds, carbonyls and metals in particulate matter. The DAQ's laboratory continues to analyze sampled particulate metals from the West Virginia toxics monitors, the National Air Toxics Trends site in Washington, D.C., and for other EPA Region III state and local agencies. As these monitoring stations are relatively recent developments, no historical database of data for analysis of long-term ambient air toxics trends exists. Additionally, there is no national criteria for ambient levels of air toxics as there are for criteria pollutants. Instead, chronic inhalation health benchmarks for cancer or non-cancer effects (such as respiratory or neurological), where such data is known, are typically used as a comparison point for ambient air toxics levels. In general, the results for West Virginia's air toxics monitors are well below these health benchmarks on an annual basis.

In 2009, the air outside about 60 schools across the country was monitored for various types of toxic air pollution as part of a new EPA initiative. Three of these schools were in West Virginia, including one each in Follansbee, Vienna and Huntington. These monitoring sites were chosen based on information in several recent screening-level studies, including one released by *USA Today* in December 2008, and other EPA data. The *USA Today* results were based on the EPA's Risk Screening Environmental Indicators (RSEI), which scores chemical facilities based on potential danger, in conjunction with emissions data submitted by facilities to the Toxic Release Inventory (TRI) program.

The DAQ worked in cooperation with the EPA to site, install and operate these air toxics monitors outside schools in West Virginia. These monitors were operated for at least 60 days in the latter part of 2009. The results have been quality assured, and have been posted to the EPA's new website on Assessing Outdoor Air Near Schools at www.epa.gov/schoolair/. The EPA posted final reports on the air toxics monitoring results to their website in 2010. Based on the results of the initial monitoring, additional monitoring may be performed at certain schools in 2011.

The DAQ also continues to work in collaboration with federal, state and local environmental and health agencies regarding the two ambient air monitors established to collect data on manganese and other metals. The monitors were located in Wood County at Vienna and Boaz and collected one year of data from April 2007 through March 2008 for the Eramet Ferromanganese Community Exposure Project. Eramet is a ferroalloy production facility located across the river in Ohio, that has air pollution impacts in West Virginia as well. While these monitors are not currently in operation, they may be used in future phases of this ongoing study. Results of manganese have been higher than expected based on air dispersion predictions. The lead agency in this project, the Agency for Toxics Substances and Disease Registry (ATSDR), launched a website where information about the air monitoring investigation, reports, and other interesting facts can be found www.atsdr.cdc.gov/sites/washington_marietta/index.html.

West Virginia Division of Air Quality Air Toxics Monitoring Network

County	Site	Type	In Operation	Carbonyls	TSP/ metals	PM10 metals	VOC	PAH
Wood	Vienna	ATSDR/ Mn Study	April '07 - March '08		√			
Wood	Boaz	ATSDR/ Mn Study	April '07 - March '08		√			
Monongalia	Morgantown	Urban	Yes	√	√		√	
Kanawha	Charleston	Urban	Yes	√	√		√	
Ohio	Wheeling	Urban	Yes	√	√		√	
US EPA air Toxics Near Schools Initiative Sites								
Brooke	Follansbee	Community	mid Sept - mid Dec. '09			√	√	√
Cabell	Huntington	Community	Sept - Oct. '09			√		
Wood	Vienna	Community	Sept - mid Nov. '09			√		

Reportable Compounds:

Carbonyls: Formaldehyde, Acetaldehyde

Metals: Beryllium, Chromium, Manganese, Nickel, Cadmium, Lead, Arsenic

VOC: Volatile Organic Compounds of Butadiene, Benzene, Vinyl Chloride (Chloroethene), Methylene Chloride, Chloroform, Carbon Tetrachloride, Dichloropropane, Trichloroethene, Tetrachloroethylene, Acrolein

PAH: Polycyclic Aromatic Hydrocarbons such as Benzo(a)pyrene and Napthalene

Diesel Emissions Reductions

Nationally, the EPA has determined diesel exhaust emissions to be a likely human carcinogen, and is working to reduce diesel exhaust emissions from many types of sources. These emissions are being reduced in West Virginia through partnerships with our sister agencies to help protect our environment at schools, via public transit, and on our highways.

As part of the EPA's National Clean Diesel Campaign, the DAQ has participated in several projects to help reduce diesel emissions in our state. These projects have been accomplished through partnerships with the West Virginia Division of Public Transit and the West Virginia Division of Highways as well as with local school districts. The DAQ received grant funding via the Diesel Emissions Reduction Act (DERA) for the first time in 2008. Then in early 2009, the American Recovery and Reinvestment Act (ARRA) added a one-time additional influx of funding to DERA for projects to reduce diesel emissions. The DAQ developed a partnership with the Office of Public Transit, within the West Virginia Department of Transportation. As a result of funding assistance from the DAQ, the first hybrid electric diesel transit buses in the state arrived in Fall 2009. These buses serve as a visible reminder of clean technology in our communities.

In the last year the DAQ has worked with Greenbrier County Schools to help provide funding so that older buses could be replaced with new, cleaner buses. The cost of five new school buses was offset with funding assistance from the DAQ as part of the National Clean Diesel Campaign. Another project has been working with the West Virginia Division of Highways to replace an old dump truck with a new 2010 emissions compliant pilot project vehicle for use in the fleet.

Eligible entities may apply directly to the EPA for competitive grant funding for clean diesel projects. To find out more check out the EPA's National Clean Diesel Campaign website www.epa.gov/cleandiesel/.

Air Quality Index

What is the Air Quality Index?

The Air Quality Index (AQI) is an index for reporting daily air quality. It indicates how clean or polluted the air is, and the associated health concerns. The AQI focuses on health effects that can happen within a few hours or days after breathing polluted air. The EPA uses the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide and nitrogen dioxide. For each of these pollutants, the EPA has established national air quality standards to protect against harmful health effects.

HOW DOES THE AQI WORK?

The AQI can be thought of as a ruler that runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health danger. For example, an AQI value of 50 represents good air quality and little potential to affect public health. An AQI value of over 300 represents hazardous air quality.

An AQI value of 100 generally corresponds to the national air quality standard for the pollutant and is thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy for certain sensitive groups of people, and then for everyone as AQI values rise.

The AQI tables and graphs on the following pages now include the more stringent 1-hour SO_2 standard for those sites that monitor SO_2. The revised SO_2 AQI has increased the number of days in the Unhealth for Sensitive Groups category (USG).

HOW DO I FIND THE AQI FOR WV?

The AQI for nine areas in West Virginia can be accessed by going to www.dep.wv.gov/daq and clicking on the AQI icon. The index may also be accessed by calling the DEP's hotline at (866) 568-6649, ext. 274.

The AQI is reported for Charleston, Greenbrier County, Huntington, Martinsburg, Morgantown, Moundsville, Parkersburg, Weirton and Wheeling year round. The reported index is the calculated value for the past 24 hours and is updated daily, Monday through Friday, at approximately 8:30 a.m. During ozone season, April 1 through October 31, updates are made in the morning and also mid-afternoon as needed.

Due to computer security constraints, the AQI must be manually updated by the DAQ staff and is not available on the weekends. However, these monitoring sites are linked with the EPA's AirNOW network at www.airnow.gov, which provides an hourly update from 9 a.m. to 9 p.m. daily during the ozone season.

The purpose of the AQI is to help citizens understand what local air quality means in relation to short-term health effects. To make the AQI as easy to understand as possible, the EPA has divided the AQI scale into six levels of health concern.

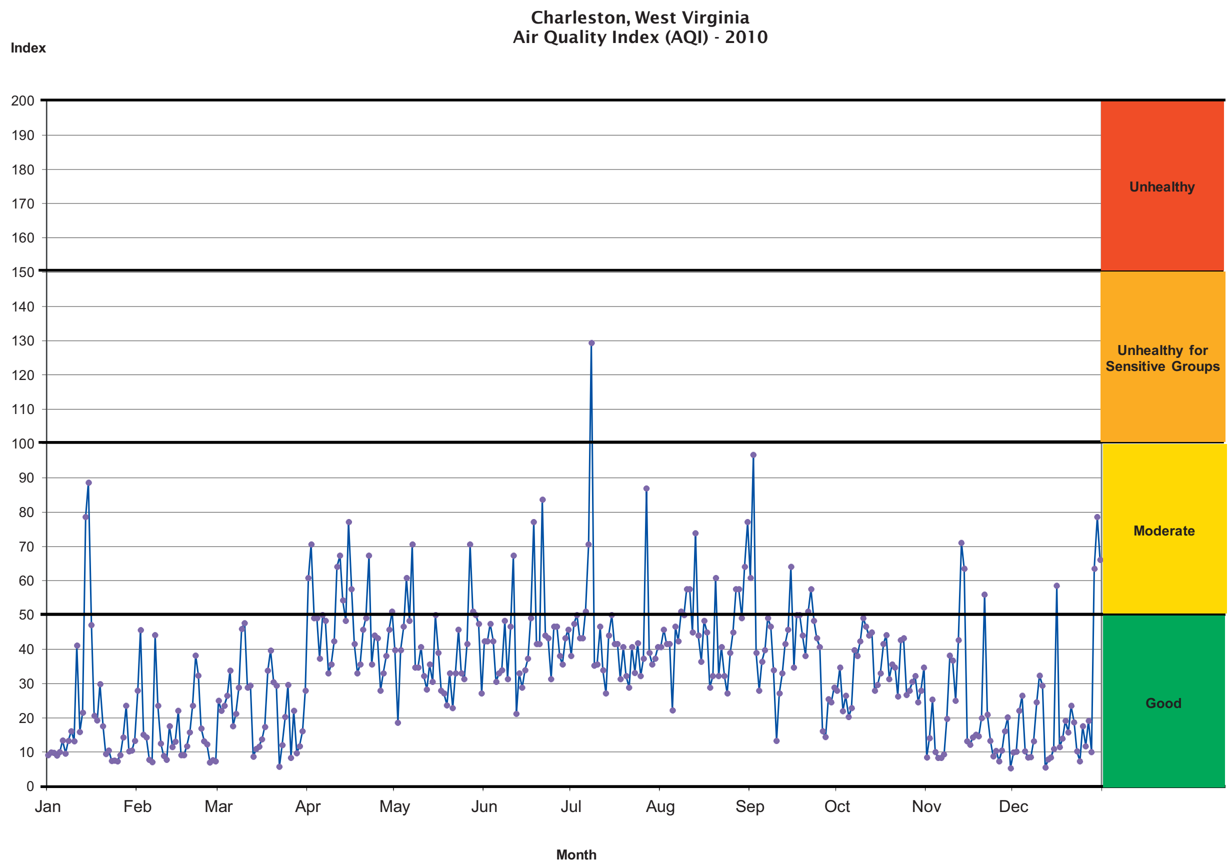
Air Quality Index

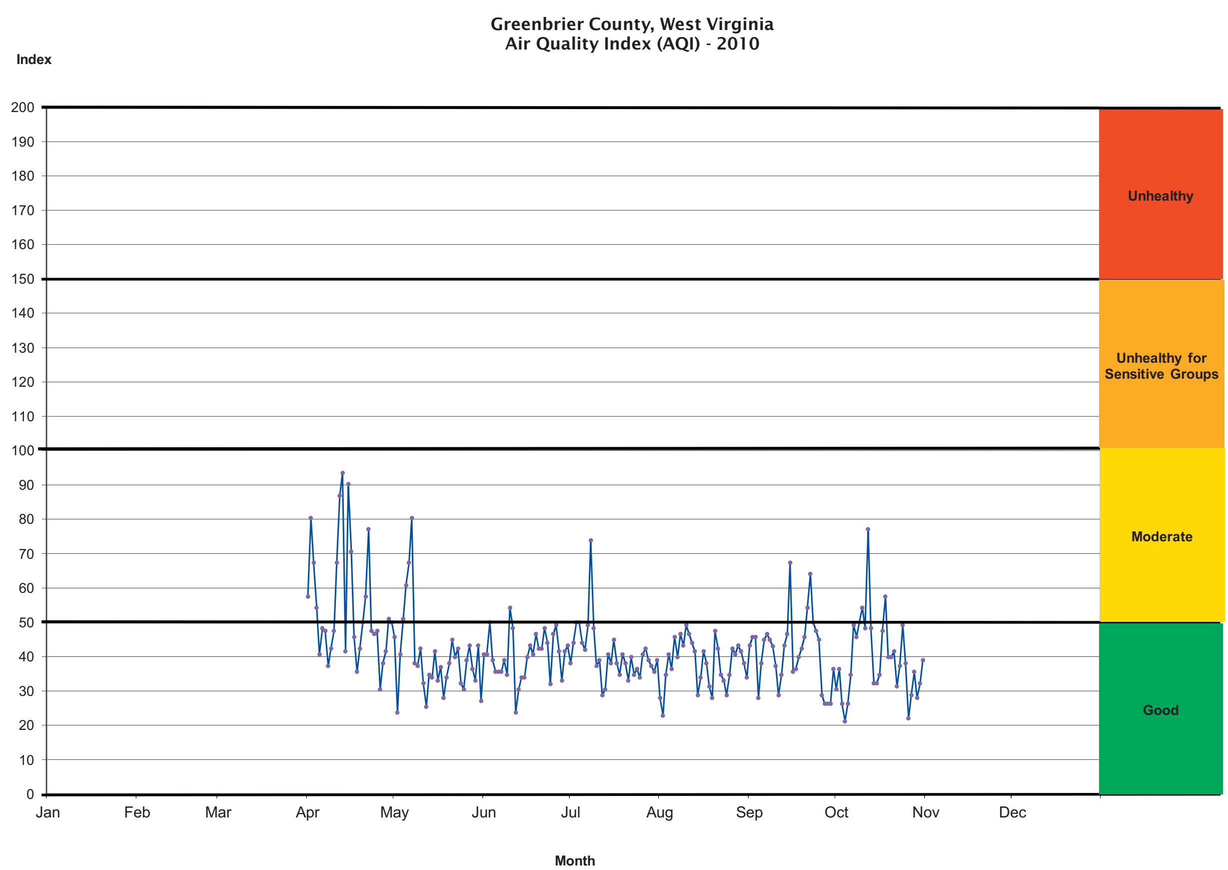
Levels of Health Concern	Numerical Value	Meaning
Good	0-50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51-100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101-150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151-200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201-300	Health alert. Everyone may experience more serious health effects.
Hazardous	301-500	Health warnings of emergency conditions. The entire population is likely to be affected

Air Quality Index for 2010

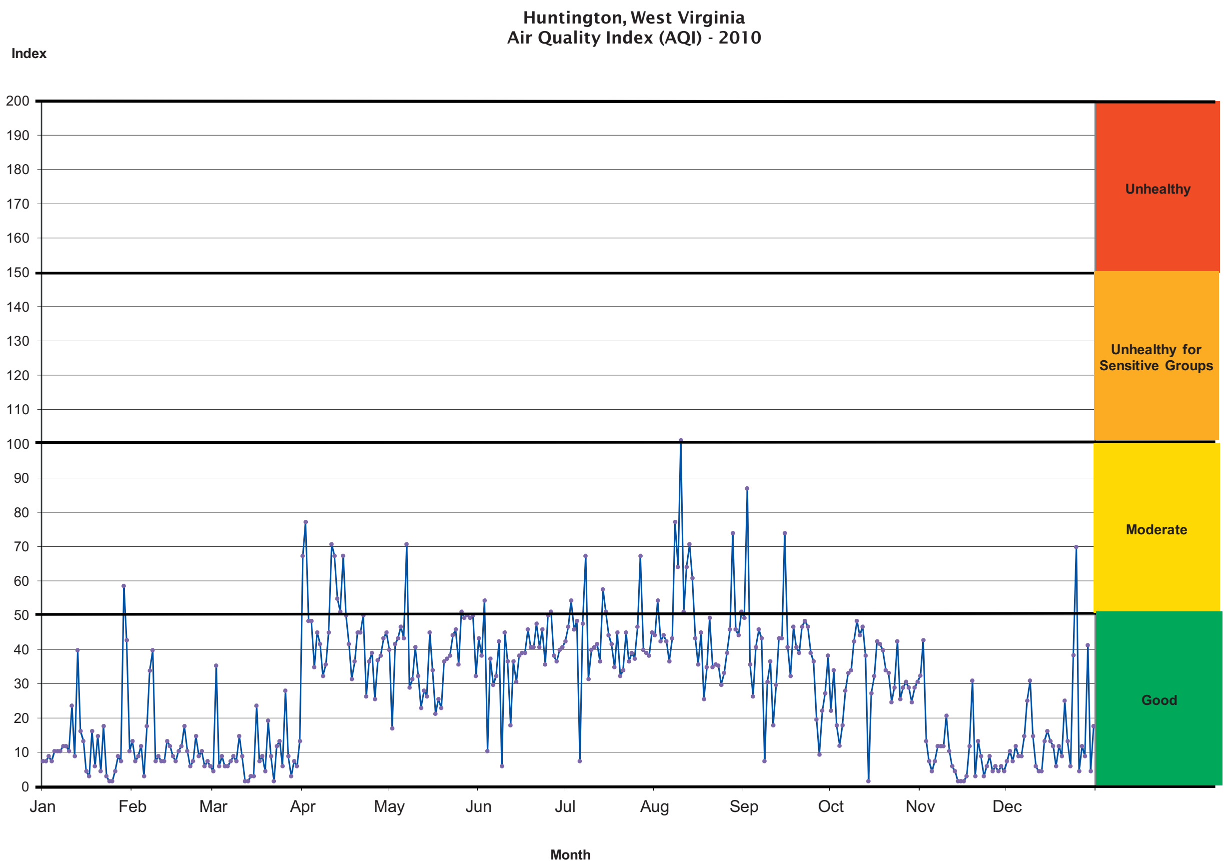
Location	Highest AQI Value	2010 - Days in each category:				Pollutants Considered
		Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	
Charleston	129	322	42	1	0	SO_2, O_3, PM_{10}
Greenbrier County	93	190	24	0	0	O_3
Huntington	101	335	29	1	0	SO_2, O_3
Martinsburg	135	163	50	1	0	O_3
Morgantown	119	323	37	5	0	SO_2, O_3
Moundsville	129	235	123	7	0	SO_2, $PM_{2.5}$
Vienna	131	273	82	10	0	SO_2, O_3
Weirton	119	308	52	5	0	CO, SO_2, O_3, PM_{10}
Wheeling	116	154	46	4	0	O_3

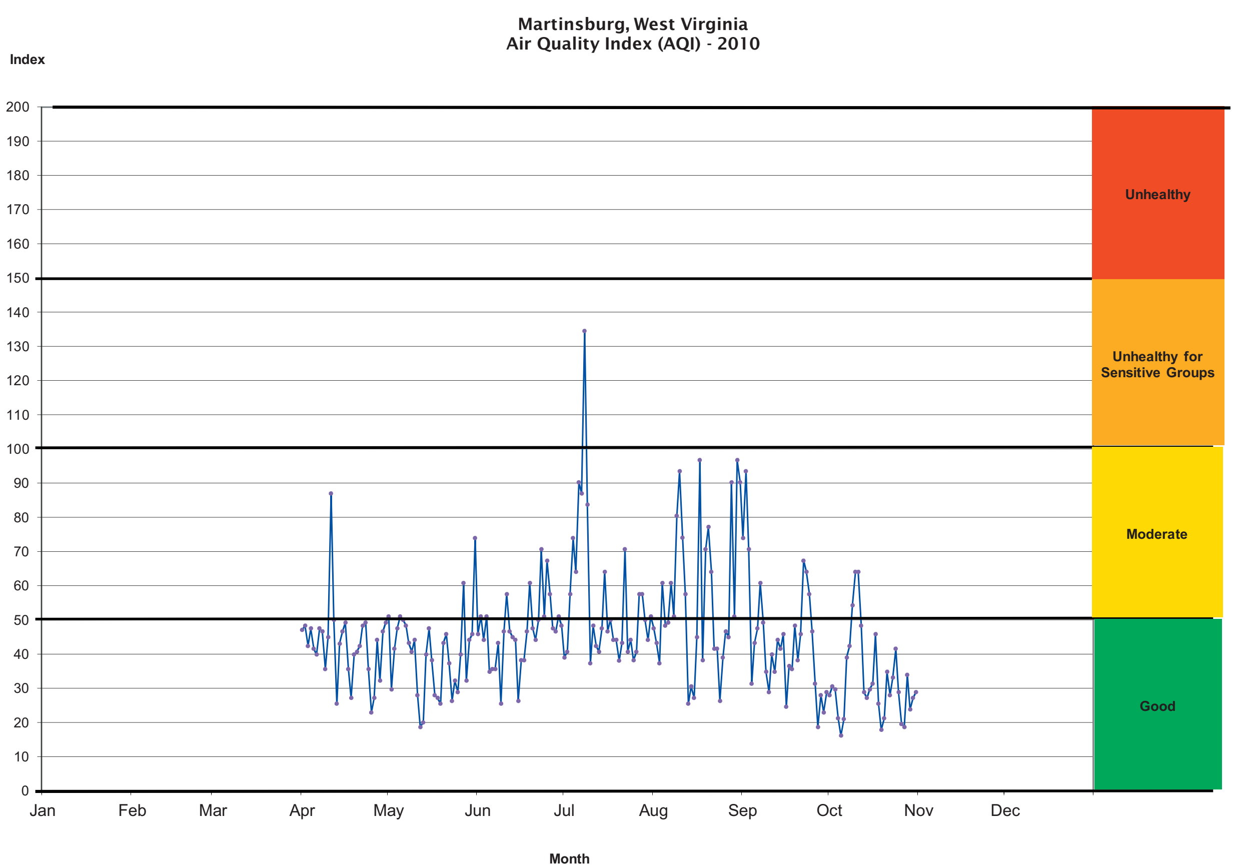
This summary now includes AQI Values that are a result of the revised, more stringent 1-hour SO_2 standards.



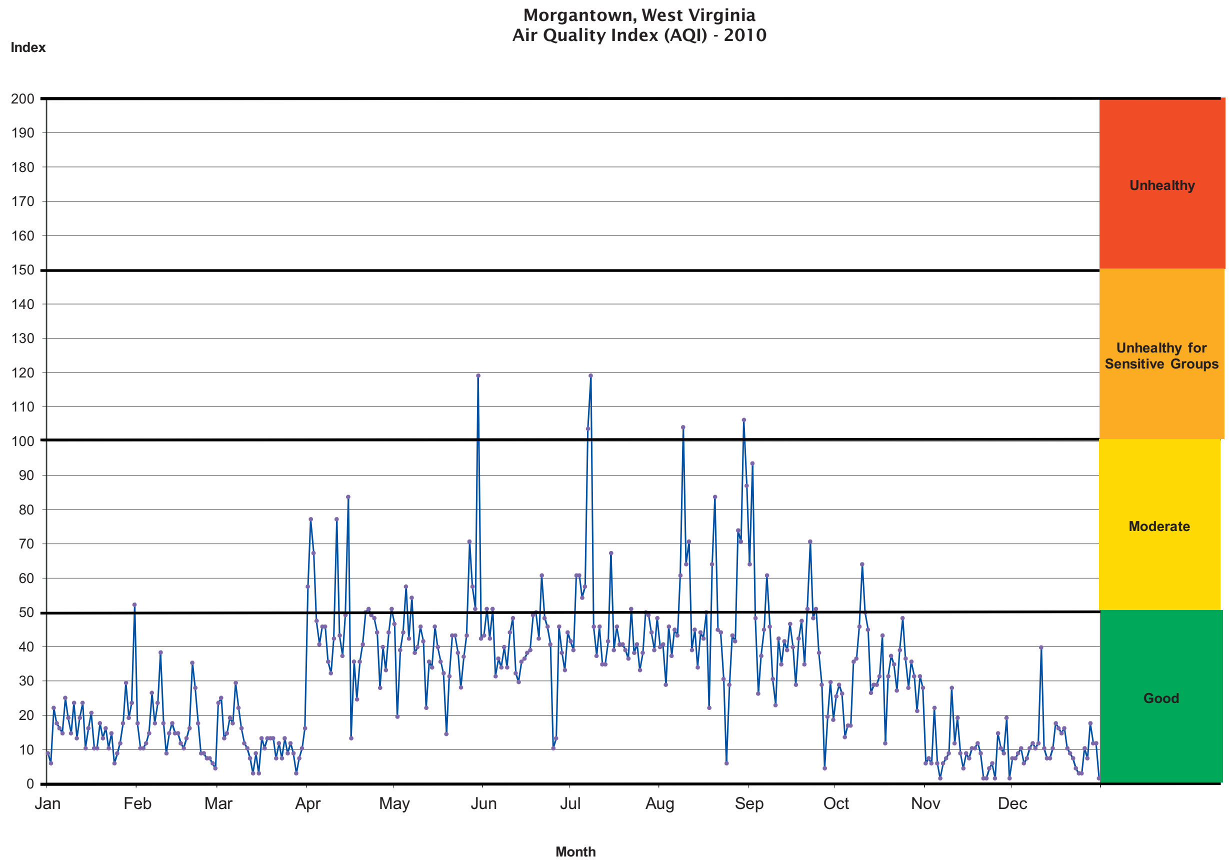


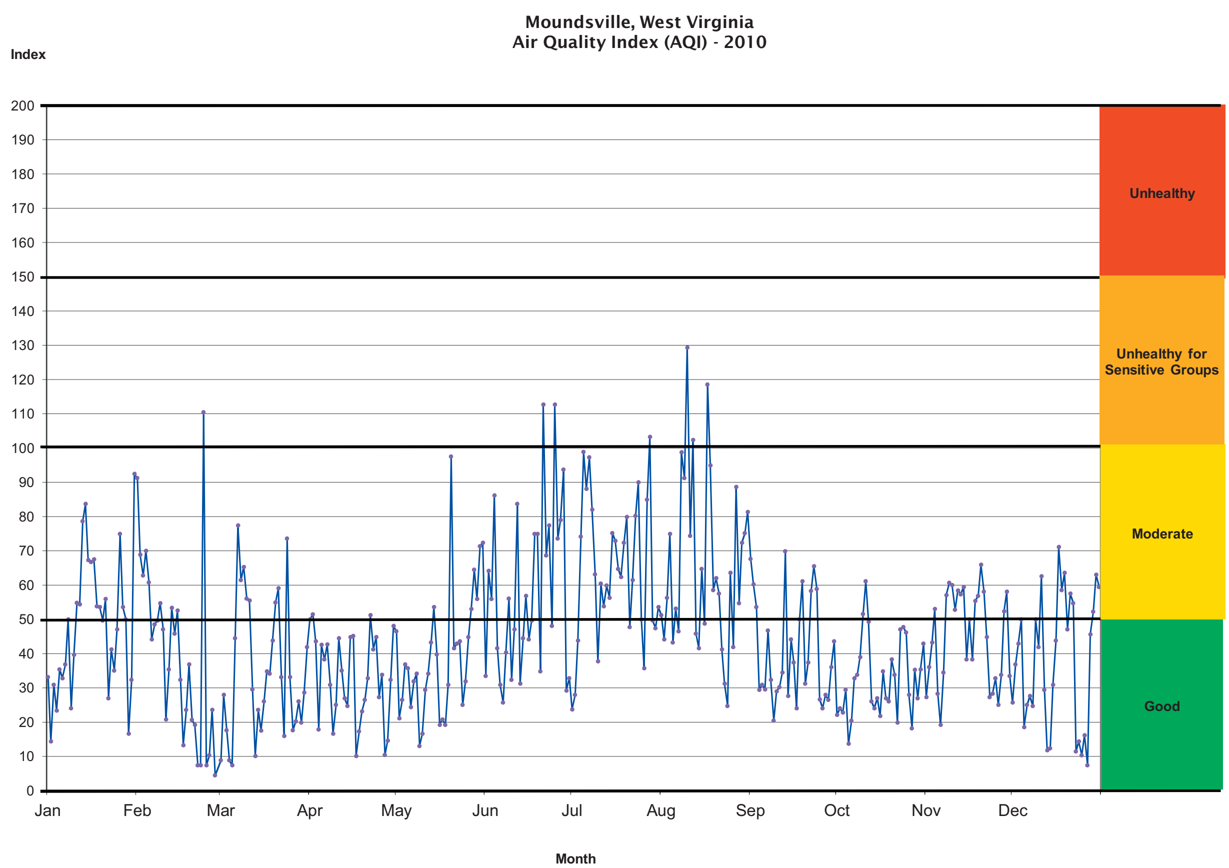
Ozone Monitoring Season is from April thru October.



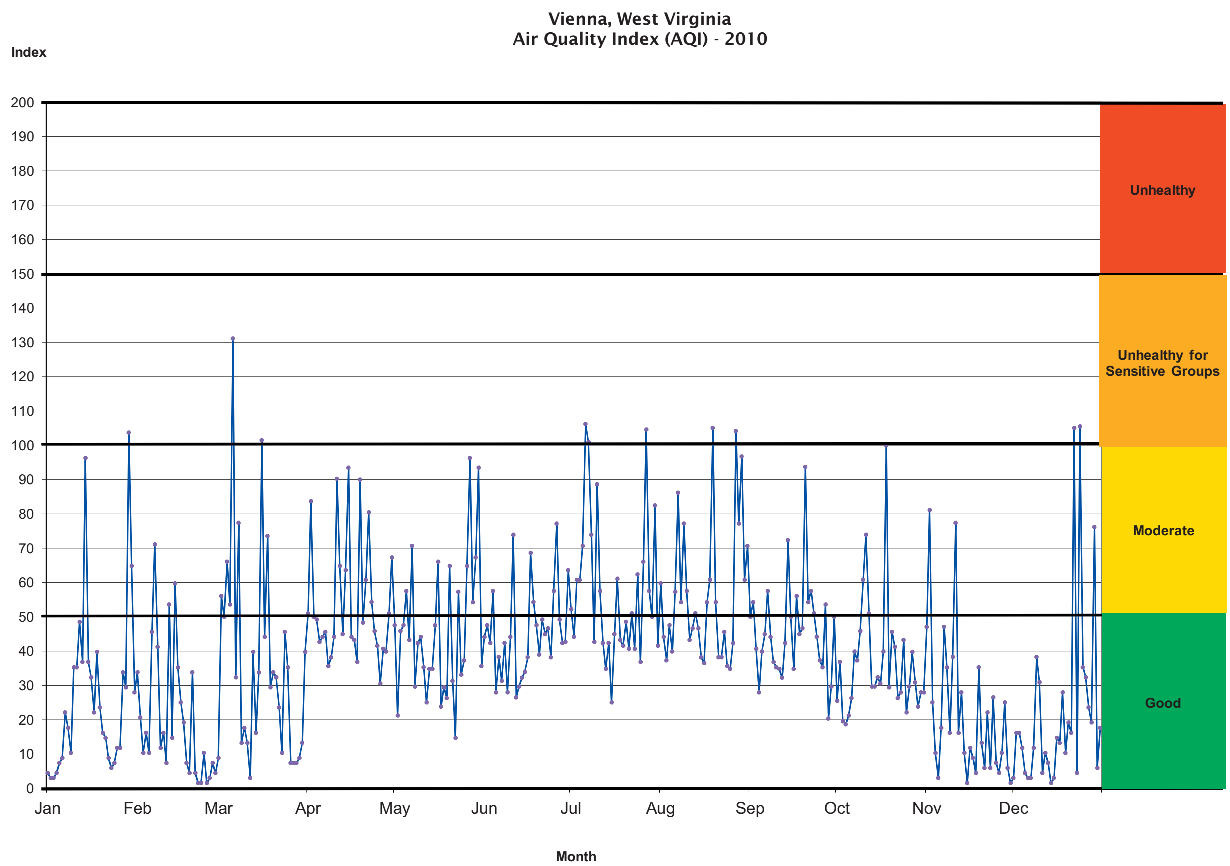


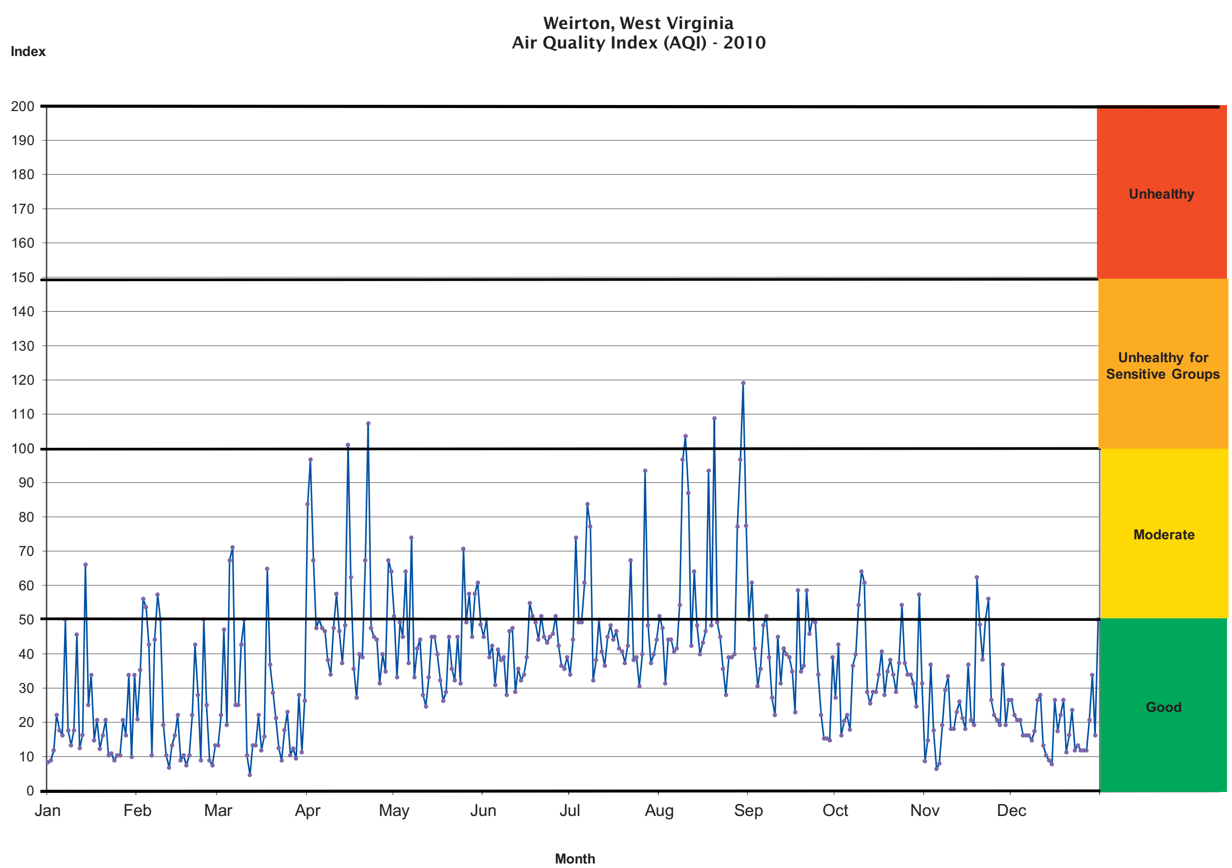
Ozone Monitoring Season is from April thru October.



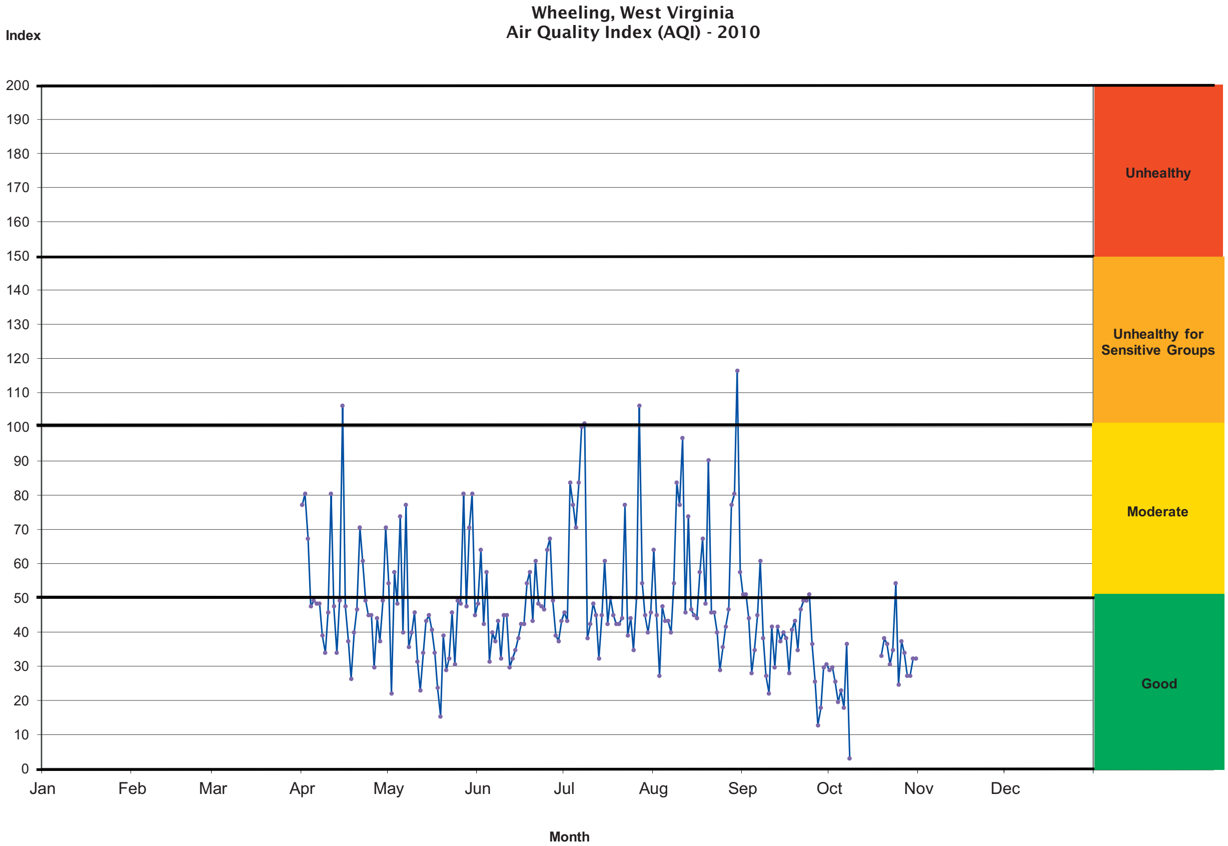


Ozone Monitoring Season is from April thru October



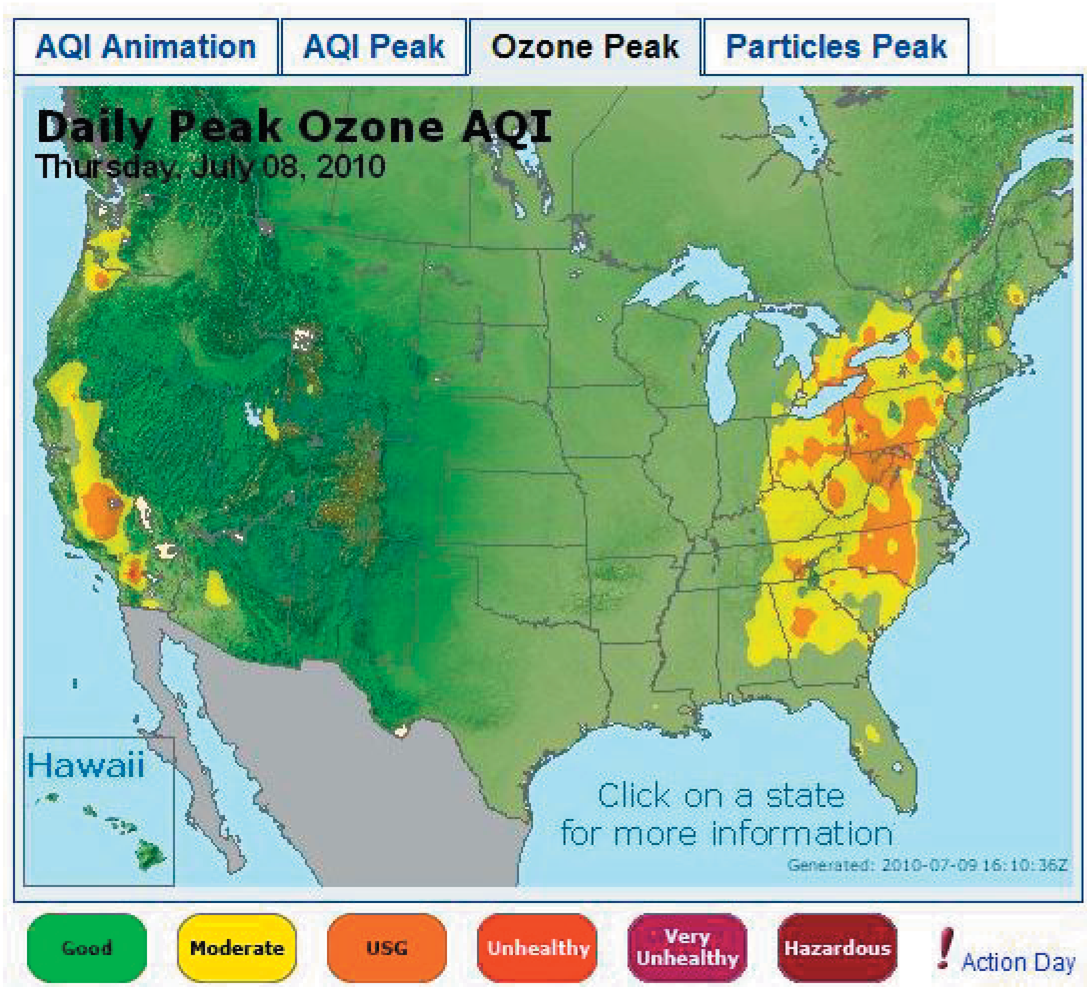


Ozone Monitoring Season is from April thru October



Ozone Monitoring Season is from April thru October.

Ozone: 8-Hour Peak AQI



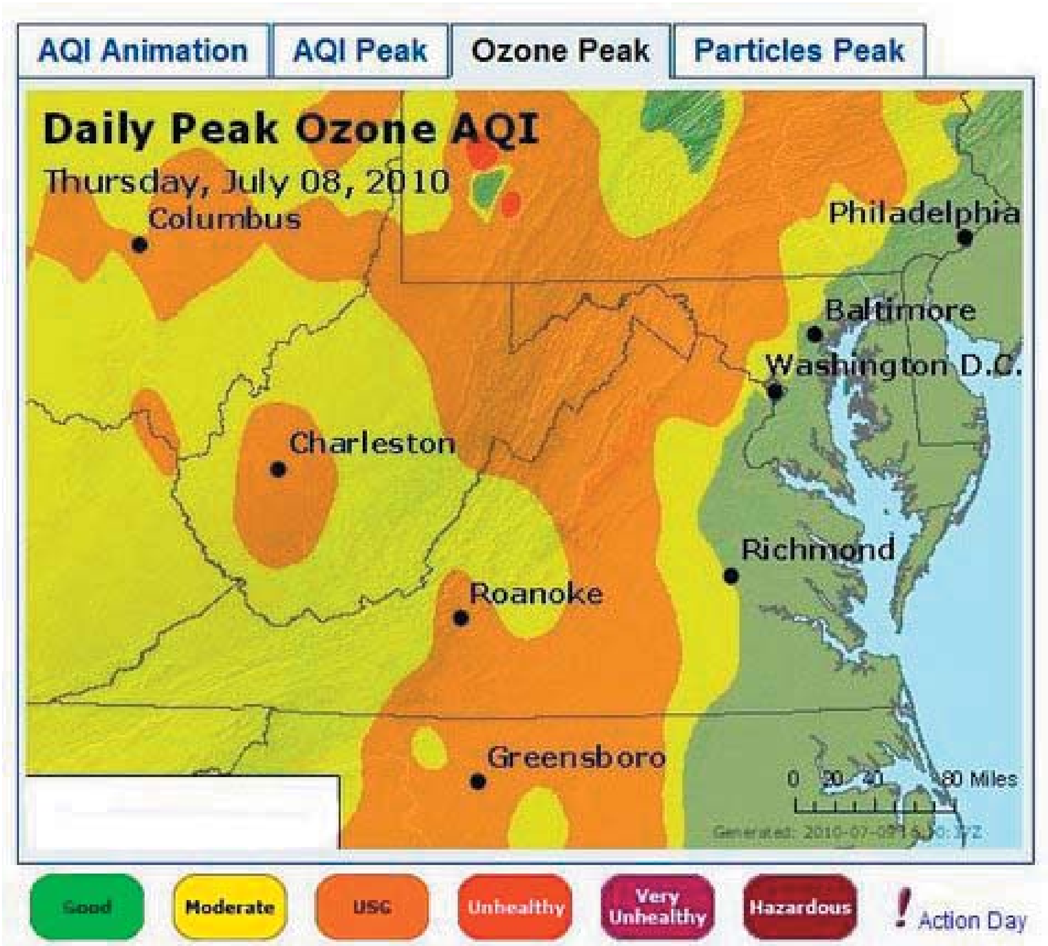
The following maps are from EPA's AirNow network, www.airnow.gov. The website was developed to provide the public with easy access to national air quality information. The network provides an hourly update for ozone data from 9 a.m. to 9 p.m. from May through September, and on a year round basis for all other pollutants.

As shown in this map, ozone levels often affect an entire region without regard to state or territorial boundaries. Every area is downwind or upwind from another.

On July 8, 2010, much of the Eastern United States recorded ozone levels in the "moderate" to "unhealthy for sensitive groups" categories. Many urban areas tend to have high levels of ozone, but even rural areas are subject to increased levels because of atmospheric circulation, and wind carried ozone as well as the pollutants from which it is formed, hundreds of miles away from their original sources.

Ground-level ozone is not emitted directly into the air, but forms through a complex chemical reaction of pollutants in the presence of sunlight. Variations in weather conditions play an important role in determining ozone concentrations. Ozone is more readily formed on warm, sunny days when the air is stagnant. Conversely, ozone production is more limited when it is cloudy, cool, rainy, or windy. As a result, ozone typically reaches elevated levels during the summer months in West Virginia.

Ozone: 8-Hour Peak AQI

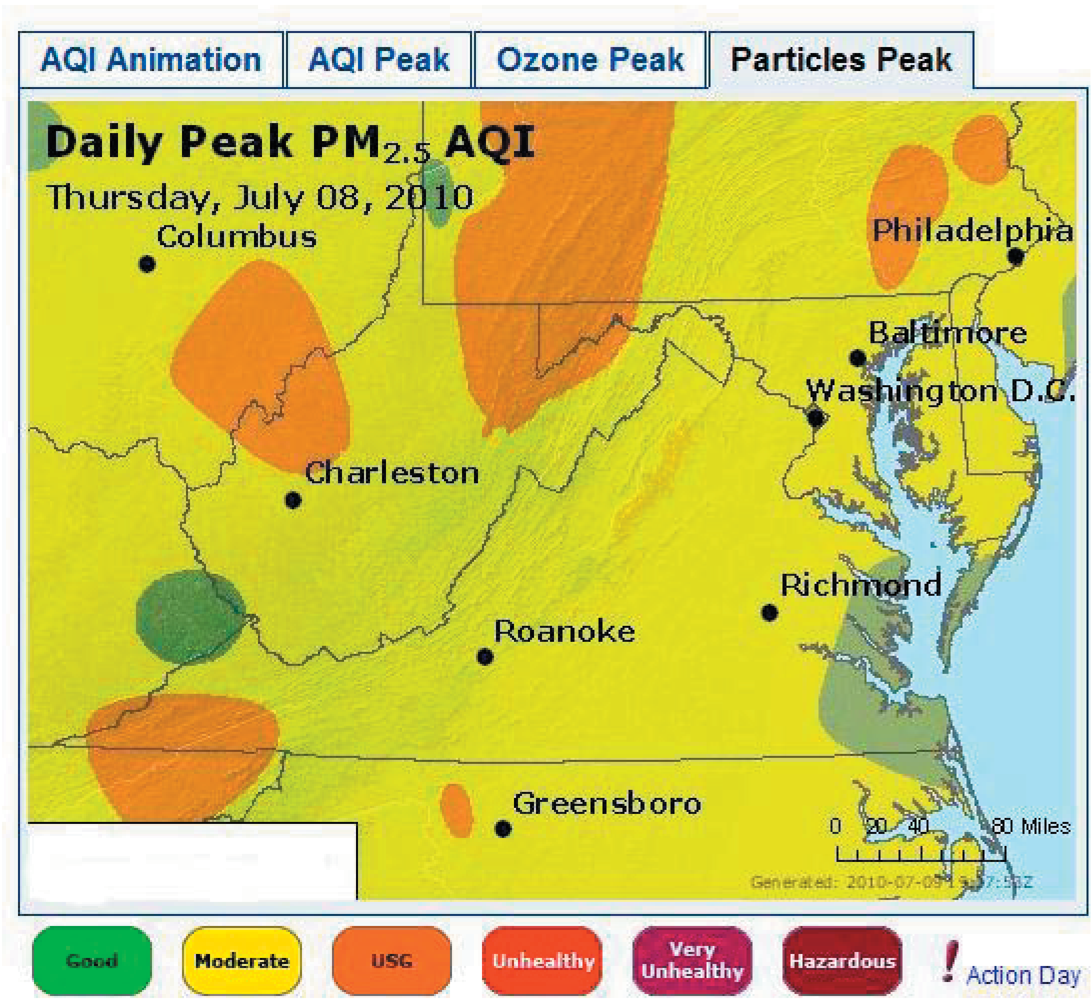


The close-up section map for July 8, 2010 shows the air quality index (AQI) values for ozone in West Virginia and neighboring states at the “moderate” to “unhealthy for sensitive groups” level. Typically, persistent high temperatures and minimal wind movement contribute to higher values.

Temperatures on and during the days before July 8 were recorded in the mid- and high-90s. No precipitation and minimal atmospheric circulation also contributed to the higher values. Because sunlight and hot weather accelerate its formation, ozone is mainly a summertime air pollutant.

Children are at increased risk from exposure to ozone because their lungs are still developing and they are more likely to be active outdoors, which increases their exposure.

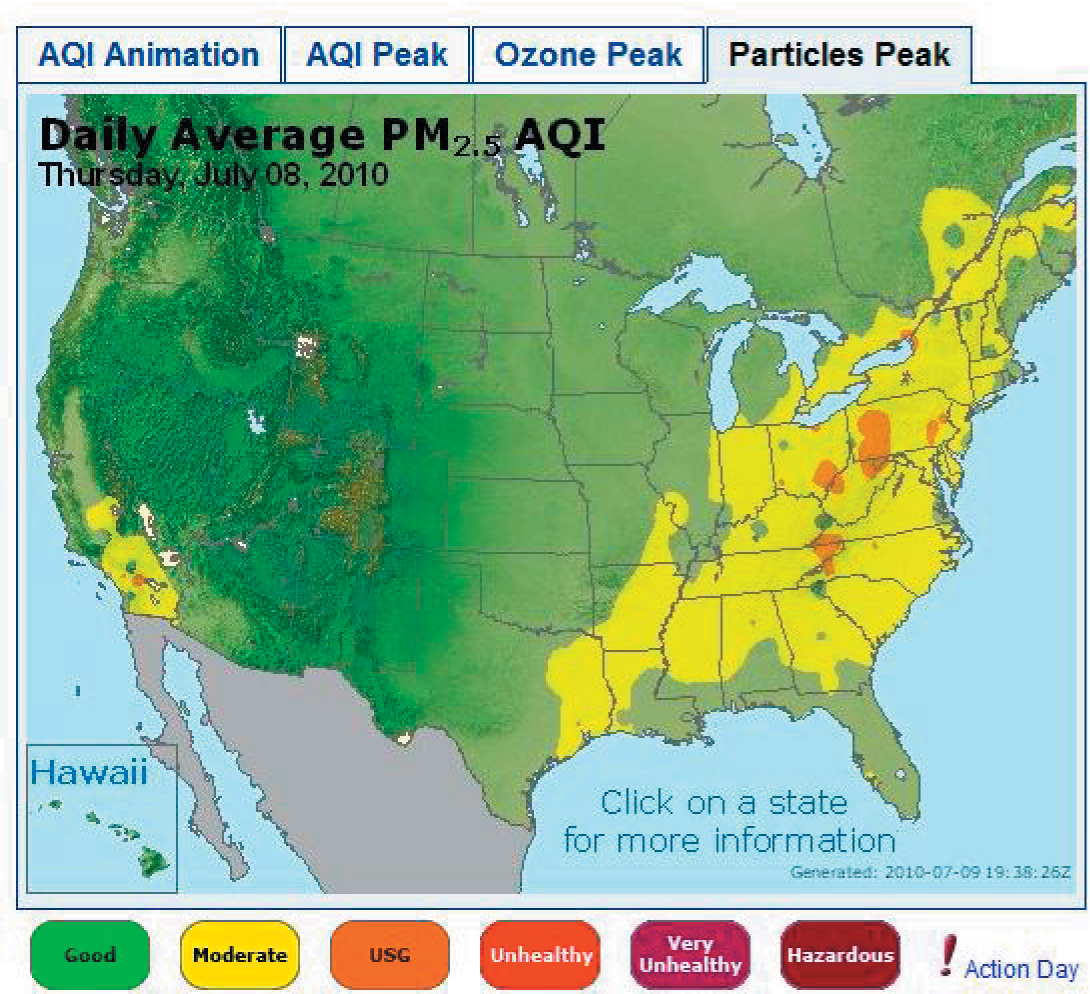
Particulate Matter ($PM_{2.5}$)
Daily 1-Hour AQI Peak



Particulate pollution, also referred to as particulate matter or PM, is the term for a mixture of solid particles and liquid droplet found in the air. Particle pollution includes “inhalable coarse particles” with diameters that are between 2.5 micrometers and 10 micrometers, and “fine particles” with diameters that are 2.5 micrometers and smaller. To put the size in perspective, think of a single human hair which at 70 micrometers is nearly 30 times larger than the largest fine particle.

Exposure to such fine particles can affect both your lungs and your heart because they can get deep into your lungs, and some can even get into your bloodstream.

Particulate Matter ($PM_{2.5}$)
Daily 1-Hour AQI Peak



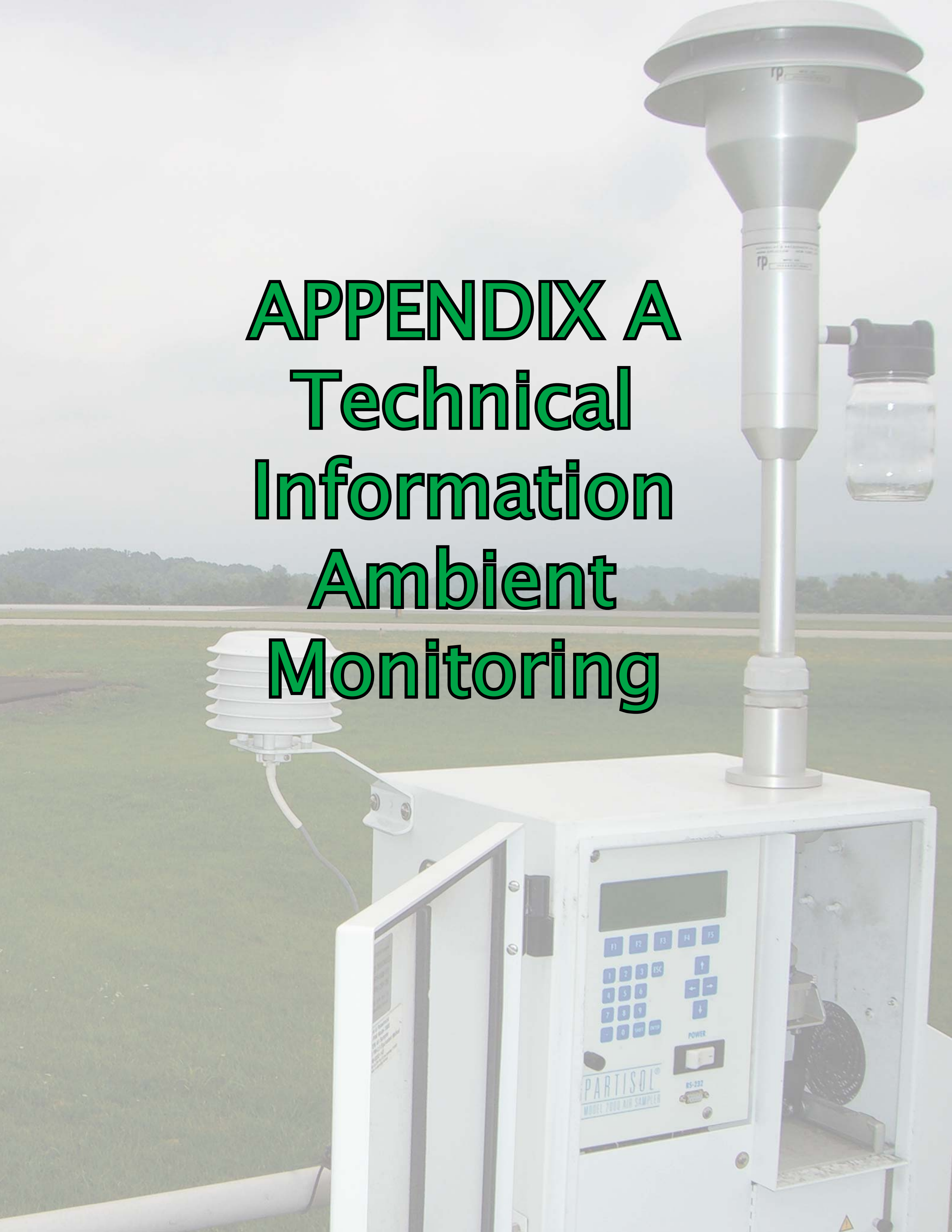
The maps for July 8, 2010 from EPA's AirNow network, www.airnow.gov, shows daily average values of $PM_{2.5}$ for most of the East Coast at the "moderate" level except for a few concentrated areas around West Virginia and its neighboring states.

Fine particles are the major cause of reduced visibility (haze) in parts of the United States, including many of our treasured national parks and wilderness areas. Those lazy, hazy days of summer can be attributed to high particle concentrations and a limited amount of precipitation to clear the air.

Sources of these particles include construction sites, unpaved roads, fields, smokestacks or forest fires. These particles are often carried over long distances by wind and then settle on ground or water.

It should be noted that the AirNOW mapping system does not report the revised hourly sulfur dioxide (SO_2) AQI.

APPENDIX A
Technical Information
Ambient Monitoring



West Virginia Division of Air Quality - Monitoring Network

CY 2010

County	PM_{10}	$PM_{2.5}$	CO	SO_2	O_3	MET	PM2.5 SPECIATION	AIR TOXICS
Berkeley		1			1			
Brooke	2	2	1	3				
Cabell		1		1	1			
Greenbrier					1			
Hancock	2	1	2	6	1	1		
Harrison		1						
Kanawha	1	2		1	1		2	1
Marion		1						
Marshall		1		1				
Monongalia		1		1	1			1
Ohio		1			1		1	1
Raleigh		1						
Wood		1		1	1			
Total Sites	5	14	3	14	8	1	3	3

OZONE (O_3)

Criteria Pollutant Summary Report - 2010

Pollutant:	Ozone
Monitoring Season:	April 1 - October 31
Data Interval:	Hourly
Units:	Parts-per-million (PPM)

National Ambient Air Quality Standards (NAAQS)

Primary NAAQS:	8-Hour (3-year average of 4th max.)	0.075 PPM
Secondary NAAQS:	Same as Primary Standard	

County	Site	EPA-ID	# Valid Days	8-Hour Averages					
				Obs >0.075	1st Max	2nd Max	3rd Max	4th Max	'08-'10 4th Max Avg
Berkeley	Martinsburg	54-003-0003	207	1	.089	.074	.074	.073	.070
Cabell	Huntington	54-011-0006	209	1	.076	.071	.068	.068	.066
Greenbrier	Sam Black Church	54-025-0003	208	0	.073	.072	.071	.069	.066
Hancock	Weirton	54-029-1004	213	4	.083	.079	.077	.076	.073
Kanawha	Charleston	54-039-0010	212	1	.087	.074	.071	.070	.069
Monongalia	Morgantown	54-061-0003	205	5	.083	.083	.078	.077	.068
Ohio	Wheeling	54-069-0010	202	4	.082	.078	.078	.076	.073
Wood	Vienna	54-107-1002	211	2	.078	.076	.074	.073	.068

PARTICULATE MATTER (PM_{10})

Criteria Pollutant Summary Report - 2010

Pollutant:	Particulate Matter PM_{10}
Monitoring Season:	January 1 - December 31
Data Interval:	24-Hour
Units:	Micro-grams per cubic meter (ug/m^3)

National Ambient Air Quality Standards (NAAQS)

Primary NAAQS:	24-Hour Average	150 ug/m^3
Secondary NAAQS:	Same as Primary Standard	

County	Site	EPA-ID	# Obs	Annual Mean	24-Hr Average				
					Obs > 150	1st Max	2nd Max	3rd Max	4th Max
Brooke	Follansbee	54-009-0005	120	21.9	0	65	59	48	45
Brooke	Weirton	54-009-0011	8594	16.9	0	58	57	50	49
Hancock	Weirton	54-029-0009	8686	17.7	0	56	49	46	46
Hancock	Weirton	54-029-1004	60	17.1	0	50	41	40	36
Hancock	Weirton	54-029-1004	8443	17.0	0	45	44	44	43
Kanawha	Charleston	54-039-0010	8672	18.9	0	51	49	48	44

PARTICULATE MATTER($PM_{2.5}$)

Criteria Pollutant Summary Report - 2010

Pollutant:	Particulate Matter $PM_{2.5}$
Monitoring Season:	January 1 - December 31
Data Interval:	24-Hour
Units:	Micro-grams per cubic meter (ug/m^3)

National Ambient Air Quality Standards (NAAQS)

Primary NAAQS:	Annual Arithmetic Mean (3yr average)	15.0 ug/m^3
	24-Hour Average (3yr average 98th percentile)	35 ug/m^3
Secondary NAAQS:	Same as Primary Standard	

County	Site	EPA-ID	# Obs	Annual Mean	24-Hour Average				3 Year Average	
					Obs > 35	98%	1st Max	2nd Max	Annual	24-Hr 98%
Berkeley	Martinsburg	54-003-0003	118	12.3	4	36.4	44.2	37.8	12.9	31
Brooke	Follansbee	54-009-0005	122	14.1	0	29.8	32.6	32.0	13.7	31
Brooke	Weirton	54-009-0011	122	13.5	2	31.6	38.0	36.3	13.1	31
Cabell	Huntington	54-011-0006	115	13.2	1	28.0	35.5	29.0	13.1	26
Hancock	Weirton	54-029-1004	122	12.6	0	31.2	34.4	33.1	12.4	31
Harrison	Clarksburg	54-033-0003	111	12.0	1	22.2	42.1	27.4	11.8	23
Kanawha	Charleston	54-039-0010	118	11.7	0	23.5	33.0	25.1	11.8	25
Kanawha	South Charleston	54-039-1005	122	13.0	0	25.3	35.1	26.2	13.2	28
Marion	Fairmont	54-049-0006	101	13.3	0	26.8	34.7	31.4	12.9	26
Marshall	Moundsville	54-051-1002	117	14.1	1	33.5	38.5	34.3	13.1	29
Monongalia	Morgantown	54-061-0003	118	11.3	0	23.9	32.7	25.4	11.5	25
Ohio	Wheeling	54-069-0010	119	12.9	0	28.2	30.5	28.7	12.4	26
Raleigh	Beckley	54-081-0002	120	10.3	0	21.3	29.0	25.4	10.1	21
Wood	Vienna	54-107-1002	117	13.4	1	28.4	41.9	30.1	13.1	28

$PM_{2.5}$ SPECIATION DATA SUMMARY

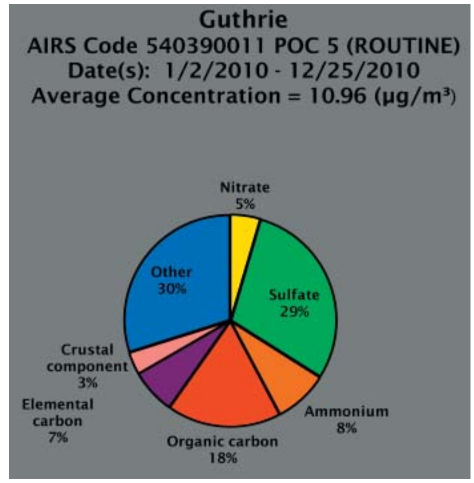
PM2.5 Speciation Data Summary - 2010

Monitoring Season: January 1 - December 31
Data Interval: 24-Hour

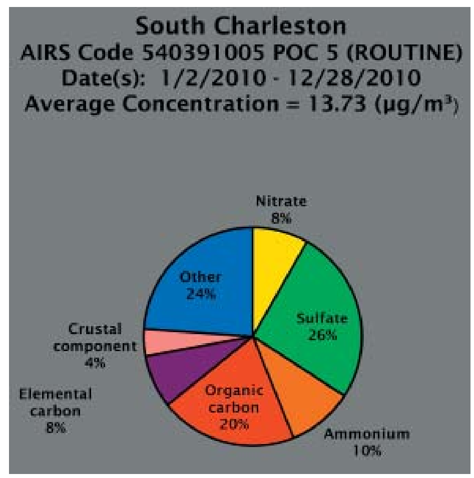
County	Site	EPA-ID	# Obs
Kanawha	Guthrie	54-039-0011	93
Kanawha	South Charleston	54-039-1005	58
Ohio	Warwood	54-069-0010	59

$PM_{2.5}$ Speciation Data Summary

Sulfates and Nitrates: Sulfates are produced by the oxidation of sulfur dioxide (SO_2) gas to water soluble sulfates particles. Nitrates are derived from the atmospheric oxidation of Oxides of Nitrogen (NO_x). Both SO_2 and NO_x are emitted from the combustion of fossil fuels such as coal fired boilers.

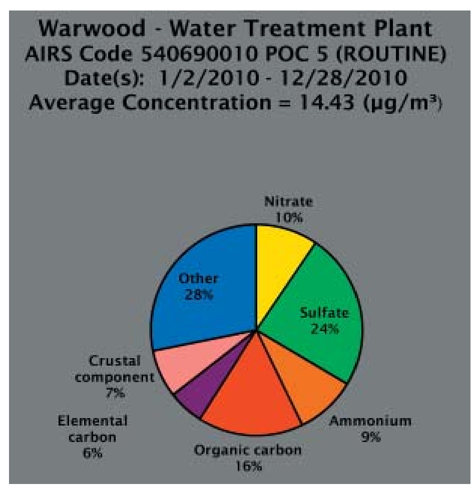


Ammonium: Atmospheric ammonia is a primary basic gas present in the atmosphere. Other significant sources of ammonia are animal waste and ammonia losses from fertilizers.



Organic Carbon: Particulate organic matter is a combination of thousands of separate compounds that contain more than 20 carbon atoms. Sources of organic compounds are wood smoke, mobile sources, fossil fuel combustion, forest fires and industrial and commercial activities such as coating or painting operations.

Elemental Carbon: Particles emitted from combustion sources that contain light-absorbing carbon is known as “black carbon” or soot. Primary sources include incomplete combustion of fuels from diesel engines, wood burning and poorly maintained industrial and residential heating units.



Crustal: Suspended fine dusts and soils containing aluminum, silicon, calcium and trace metals. Emissions are primarily from roads, construction and agricultural activities such as tilling.

SULFUR DIOXIDE (SO_2)

Criteria Pollutant Summary Report - 2010

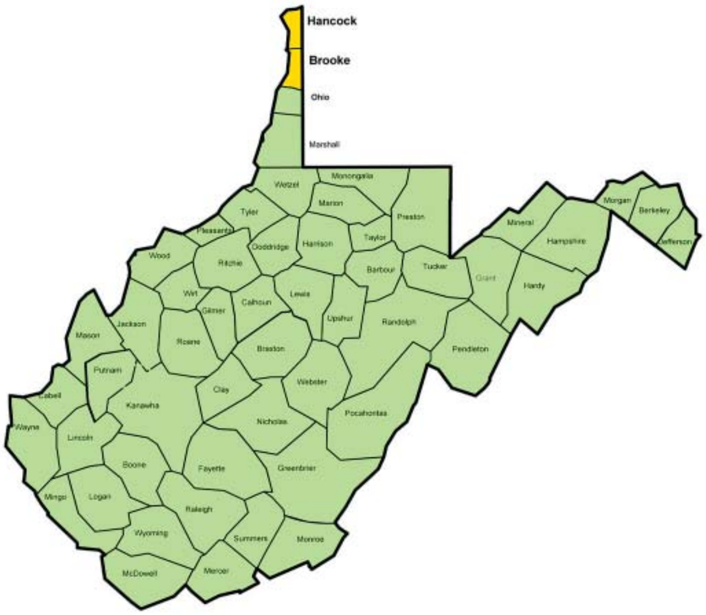
Pollutant:	Sulfur Dioxide
Monitoring Season:	January 1 - December 31
Data Interval:	Hourly
Units:	Parts-per-billion (PPB)

National Ambient Air Quality Standards (NAAQS)

Primary NAAQS:	1-Hour Daily Max 3 Year 99% Average	75 PPB
Secondary NAAQS:	3-Hour Average	500 PPB

County	Site	EPA-ID	# Obs	Annual Mean	1-Hr Average				3-Hr Average		
					1st Max	2nd Max	99%	08-10 99%	Obs > 500	1st Max	2nd Max
Brooke	Follansbee	54-009-0005	8680	6.25	310	201	131	127	0	159	122
Brooke	Weirton	54-009-0007	8604	8.84	234	175	92	103	0	135	100
Brooke	Weirton	54-009-0011	8302	7.39	392	229	143	148	0	269	155
Cabell	Huntington	54-011-0006	8568	3.18	50	41	31	35	0	31	27
Hancock	New Manchester	54-029-0005	8430	5.78	111	93	85	126	0	90	80
Hancock	New Cumberland	54-029-0007	8597	5.14	108	72	50	103	0	68	57
Hancock	Chester	54-029-0008	8711	4.30	85	72	44	99	0	54	50
Hancock	Weirton	54-029-0009	8507	5.63	177	76	68	121	0	114	54
Hancock	Lawrenceville	54-029-0015	8705	4.09	98	88	68	99	0	81	69
Hancock	Weirton	54-029-1004	8552	5.78	89	56	51	97	0	72	68
Kanawha	Charleston	54-039-0010	8606	3.89	65	57	51	63	0	54	46
Marshall	Moundsville	54-051-1002	8712	6.68	138	114	101	92	0	81	73
Monongalia	Morgantown	54-061-0003	8562	3.17	36	27	24	112	0	30	18
Wood	Vienna	54-107-1002	8405	6.30	142	85	84	117	0	80	69

CARBON MONOXIDE (CO)



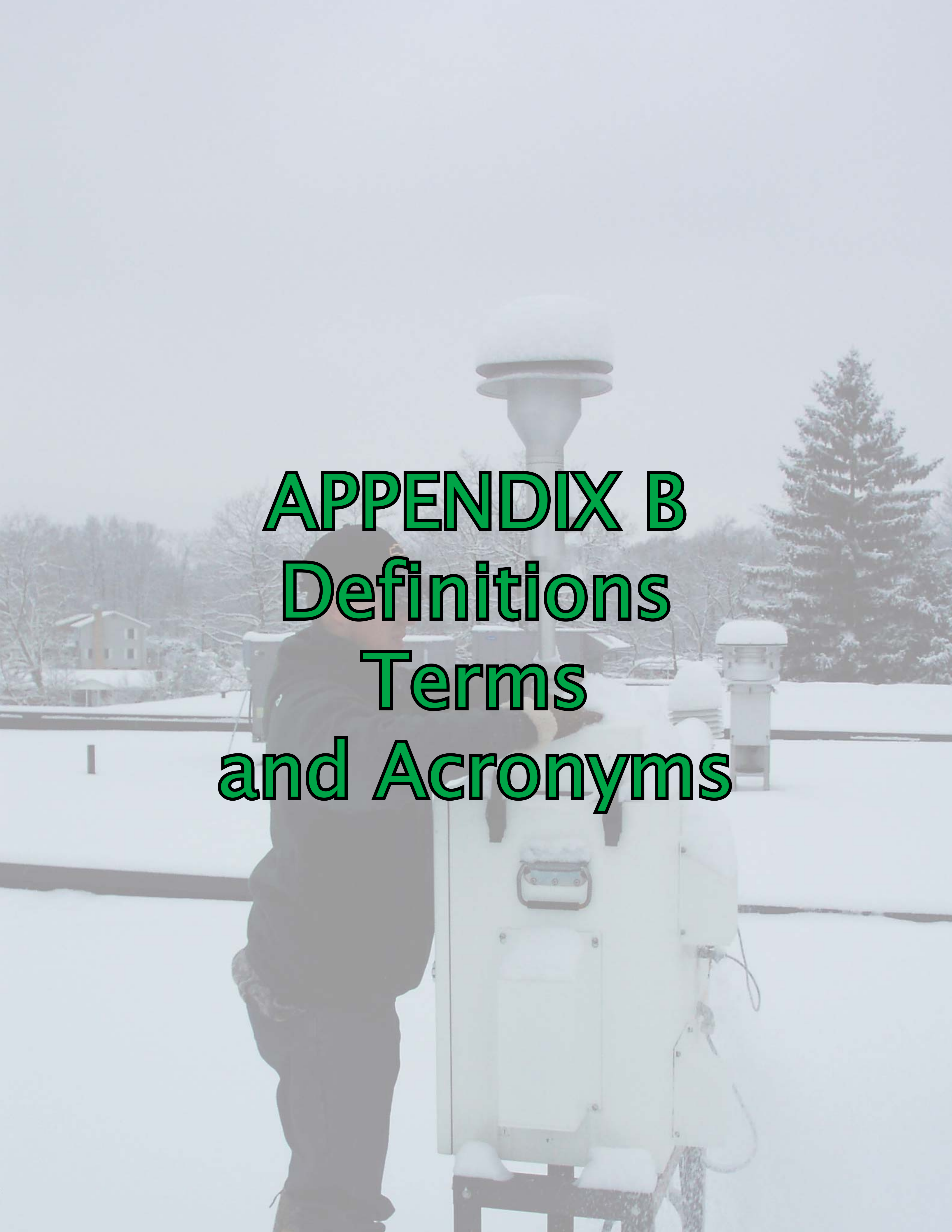
Criteria Pollutant Summary Report - 2010

Pollutant:	Carbon Monoxide
Monitoring Season:	January 1 - December 31
Data Interval:	Hourly
Units:	Parts-per-million (PPM)

National Ambient Air Quality Standards (NAAQS)

Primary NAAQS:	1-Hour Average	35 PPM
	8-Hour Average	9 PPM
Secondary NAAQS:	None	

County	Site	EPA-ID	# Obs	1-Hr Average			8-Hr Average		
				Obs >35.0	1st Max	2nd Max	Obs >9.0	1st Max	2nd Max
Brooke	Weirton	54-009-0011	8704	0	1.8	1.1	0	.8	.8
Hancock	Weirton	54-029-0009	8701	0	1.1	1.0	0	.8	.8
Hancock	Weirton	54-029-1004	8666	0	1.7	1.6	0	.9	.8



APPENDIX B Definitions Terms and Acronyms

Acid precipitation or acid rain
Water falling in drops condensed from vapor in the atmosphere with acidic qualities. Principal components typically include nitric and sulfuric acid with water vapor.

Air pollutants
Solids, liquids, or gases which, if discharged into the air, may result in statutory air pollution.

Air pollution
Statutory air pollution has the meaning ascribed to it in West Virginia Code §22-5-2.

Air toxics
Term generally referring to hazardous air pollutants, and used in the context of implementation of a program to address such emissions and their impacts.

Ambient air
Generally, the atmosphere; outdoors.

Anions
Negatively charged molecule, such as sulfate and nitrate. In combination with hydrogen, these molecules act as strong acids.

Annual arithmetic mean
The numerical average of the data for the year.

AQI
Air Quality Index.

Attainment
EPA designation that an area meets the National Ambient Air Quality Standards.

24-hour average
The average concentration for a 24-hour period.

CAA
Clean Air Act.

CAIR
Clear Air Interstate Rule.

Carbon Sequestration
The physical process by which emissions of a greenhouse gas are directly captured for storage in a reservoir, or the biologic process by which a greenhouse gas is indirectly removed from the atmosphere for storage in a sink.

Cations
Positively charged ions, such as magnesium, sodium, potassium and calcium, that increase pH of water (make it less acidic) when released to solution through mineral weathering and exchange reactions.

CO
Carbon monoxide.

Criteria pollutant
An air pollutant for which certain levels of exposure have been determined to injure health, harm the environment and cause property damage. EPA-developed National Ambient Air Quality Standards, using science-based guidelines as the basis for setting acceptable levels.

DAQ
Division of Air Quality - Department of Environmental Protection office that administers West Virginia's air quality management program for the protection of public health, welfare, and the environment.

DEP
Department of Environmental Protection - West Virginia's regulatory agency charged with protecting and promoting a healthy environment.

De minimis
Refers to a level which is considered to be insignificant.

EAC
Early Action Compact.

Elements
Chemicals, such as hydrogen, iron, sodium, carbon, nitrogen, or oxygen, whose distinctly different atoms serve as the basic building blocks of all matter. There are 92 naturally occurring elements. Another 15 have been made in laboratories. Two or more elements combine to form compounds that make up most of the world's matter.

Emissions
Air pollutants exhausted from a unit or source into the atmosphere.

Exceedance
An incident occurring when the concentration of a pollutant in the ambient air is higher than the National Ambient Air Quality Standards.

EPA or U.S. EPA
Environmental Protection Agency, federal agency that oversees the protection of the environment.

Fossil fuels
Natural gas, petroleum, coal or any form of solid, liquid or gaseous fuel derived from such material.

Greenhouse gas
The gaseous compounds: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (SF_6).
.

HAP
Hazardous Air Pollutant.

MACT
Maximum Achievable Control Technology.

Mercury
A naturally occurring element that is found in air, water and soil. It exists in several forms, elemental or metallic mercury, inorganic mercury compounds, and organic mercury compounds. Elemental or metallic mercury is a shiny, silver-white metal and is liquid at room temperature.

MSA
Metropolitan Statistical Area.

NAAQS
National Ambient Air Quality Standards, set by EPA to protect human health and welfare.

NCore
A multi pollutant network that integrates several advanced measurement systems for particles, pollutant gases and meteorology.

Nonattainment
EPA designation that an area does not meet the National Ambient Air Quality Standards.

NO_x
Nitrogen oxides.

O_3
Ozone.

Ozone season
The period beginning April 1 and ending on September 30 of the same year.

Pb
Lead.

PM
Particulate Matter.

$PM_{2.5}$
Particles that are 2.5 micometers in size. These fine particles can be easily inhaled deep into the lungs where they can accumulate, react, be cleared or absorbed. These particles are about 30 times smaller than the diameter of a human hair.

PM_{10}
Particles that are 10 micrometers in size or less. This includes both fine particles (2.5 micrometers or less) and inhalable coarse particles having diameters larger than 2.5 micrometers and smaller than 10 micrometers.

Particulate Matter
Any material, except uncombined water, that exists in a finely divided form as a liquid or solid.

ppb
Parts per billion by volume.

ppm
Parts per million by volume.

Precursor
A substance that is the source of or aids in the formation of another substance.

Regulated air pollutant
Any air pollutant subject to a standard or other requirement promulgated under section 112 of the Clean Air Act, or any air pollutant for which a National Ambient Air Quality Standard has been promulgated including particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone and lead or lead compounds.

Sinks
Any process, activity or mechanism which removes a greenhouse gas from the atmosphere. Forests are considered sinks because they remove carbon dioxide through photosynthesis.

SIP
State Implementation Plan. Plan to attain and maintain the National Ambient Air Qualiity Standards for criteria pollutants.

SO_2
Sulfur dioxide.

Source or stationary source
Any governmental, institutional, commercial or industrial structure, installation, plant, building or facility that emits or has the potential to emit any regulated air pollutant under the Clean Air Act.

Statutory Air Pollution
The discharge into the air by the act of man, of substances (liquid, solid, gaseous, organic or inorganic) in a locality, manner and amount as to be injurious to human health or welfare, animal or plant life, or property, or which would interfere with the enjoyment of life or property.

$\mu g/m^3$
Micrograms per cubic meter.

VISTAS
Visibility Improvement - State and Tribal Association of the Southeast.

VOC
Volatile organic compound.

West Virginia Department of Environmental Protection - Division of Air Quality
www.dep.wv.gov/daq

Environmental Protection Agency
www.epa.gov/

Air Quality Data
EPA Office of Air and Radiation - Air Quality Planning and Standards
AIRS Web - Access to national and state air pollution and emissions data
www.epa.gov/air/data/

Air Explorer - Collection of user-friendly visualization tools for air quality analysis
www.epa.gov/airexplorer/

Air Monitoring - Provides information for evaluating the status of the atmosphere as compared to clean air standards and historical information
www.epa.gov/oar/oaqps/montring.html

Air Now - Ozone mapping, AQI and real time data
www.airnow.gov/

Air Quality and Emissions Trends Reports - Trends Reports are EPA's "report card" on the status of air quality and air pollutant emissions
www.epa.gov/airtrends/reports.html

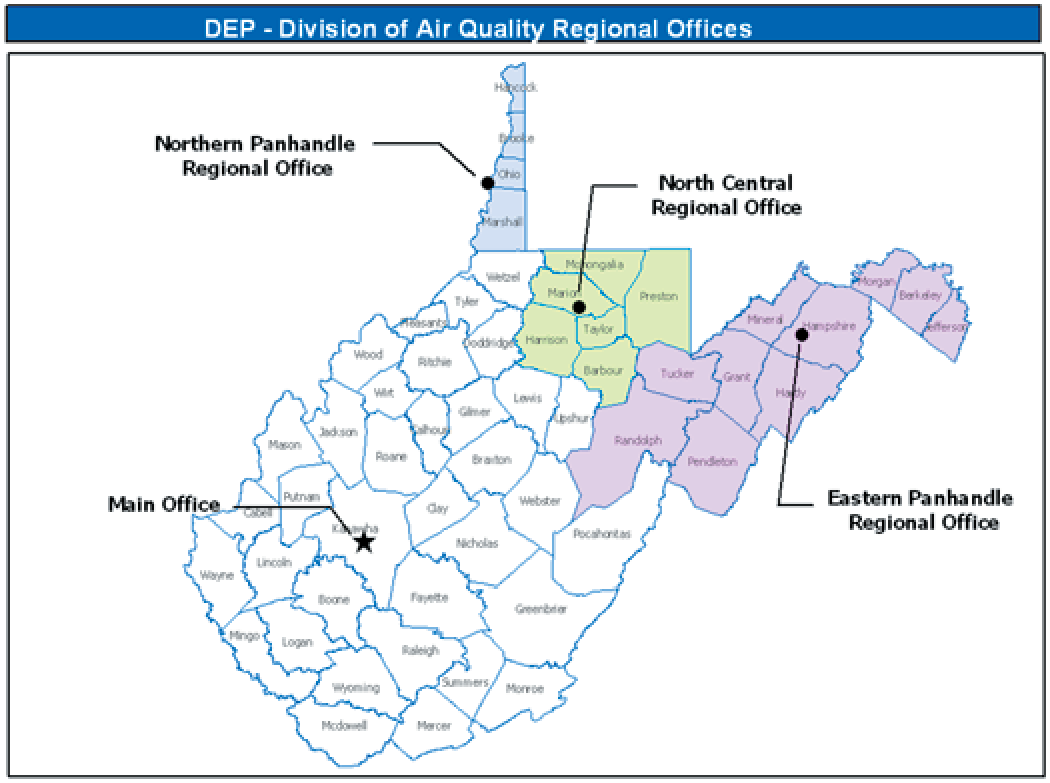
National Institute of Chemical Studies
www.nicsinfo.org/

Nonattainment area descriptions
www.epa.gov/oar/oaqps/greenbk/

EPA Technology Transfer Network (TTN Web)
Air Quality Monitoring www.epa.gov/ttn/amtic/
NAAQS Information www.epa.gov/ttn/naaqs/

Education
Links for educational resources
www.epa.gov/epahome/educational.htm

Provides links to outreach efforts about technical air training, upcoming conferences and environmental education
www.epa.gov/air/oaqps/eog/



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Small Business Assistance Program:

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