2011 Air Quality Annual Report

dep
west virginia

Cover photos from 2012 Department of Environmental Protection Earth Day Celebration

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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Director's Page

The *2011 Air Quality Annual Report* represents the 10th year the West Virginia Department of Environmental Protection (DEP) has provided a comprehensive resource to communicate the quality of air in West Virginia to our citizens, industry, organizations and other interested parties.

The Division of Air Quality's (DAQ's) current data show a steady decline of air pollutant emissions over the years. In relation to the federal air standards, the graphs and charts developed from data collected from our statewide monitoring network provide an overview of air quality trends. Although all areas in the state are currently showing attainment for national standards based on monitoring data, follow-up documentation to finalize the designation for particulate matter emissions continues to be submitted.

The DAQ is continuously replacing and upgrading ambient air monitoring sites to meet the U.S. Environmental Protection Agency's (EPA) siting requirements. This past year, staff in the monitoring section worked to upgrade a monitoring site in Moundsville, West Virginia. Many hours were invested on the site development plan to ensure the new location would be a safe and secure place to collect air monitoring data. This site will be used as a template for other statewide ambient air monitoring site installations and upgrades in the future.

The development of new industrial technologies continues to create environmental challenges for the state's regulatory agencies. In recent years, the oil and gas industry has seen a boom in the activity associated with horizontal drilling in the Marcellus Shale formation. This increase in drilling activity has created new challenges with maintaining healthy air, water and land usage. Air quality issues associated with the oil and gas sector are an expanding aspect of the DAQ's regulatory responsibilities. In December 2011, the West Virginia Legislature directed the DEP to conduct several studies regarding impacts from horizontal well drilling activities on air quality, as well as the safety of pits and impoundments. The DEP is working with West Virginia University to design a study on the air impacts from horizontal well drilling operations. The results of the study may determine if more stringent regulations are required for these operations. In addition, the EPA is scheduled to promulgate, by early summer 2012, new standards to address the air emissions associated with horizontal drilling.

DAQ staff continues to collaborate with others to educate the public on a variety of issues such as air toxics, diesel emission reduction, energy efficiency, and healthy schools.

We are open to any comments and suggestions to enhance this publication and the air quality management program.

John A. Benedict, Director

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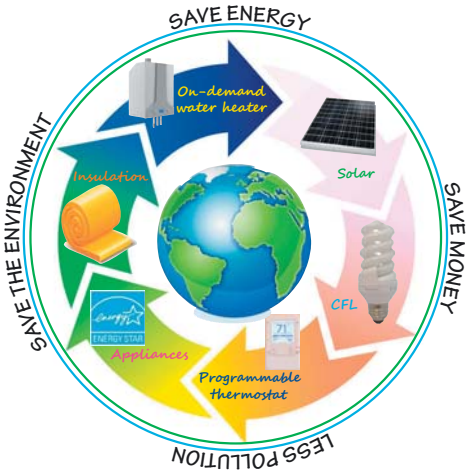


National Ambient Air Quality Standards

Pollutants with Standards

Critera Pollutants

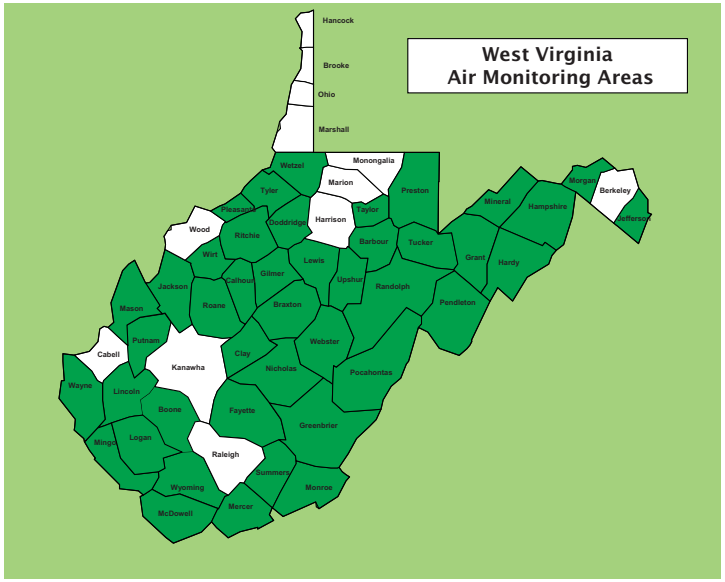
The Clean Air Act, which was amended in 1990, requires that the EPA set National Ambient Air Quality Standards (NAAQS) for pollutants considered to be harmful to public health and the environment. Two kinds of standards were established for acceptable concentrations of specific pollutants in the ambient (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 2011, the EPA finalized the ambient air quality standards for CO. The agency decided to retain the existing standard, concluding that the current standard provides the required level of public health protection.

West Virginia maintains a statewide network of monitoring stations as shown in Appendix A, page 33. 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.



Six principal pollutants currently have ambient air quality standards: ground-level ozone, particulate matter, sulfur dioxide, carbon monoxide , nitrogen dioxide and lead. These are commonly called the criteria pollutants.

Ozone Standard Highlights

The EPA toughened 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 tightening of the standard, 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 deaths.

The EPA initially delayed implementation of the 2008 ozone standard to reconsider whether it was adequately protective of human health. That effort was cut short in September 2011 and the EPA decided to implement the standard as it stood. Therefore, final designations under the 2008 ozone standard are expected in spring 2012. In a December letter to Governor Tomblin, the EPA Region 3 administrator notified the state that the agency planned to designate the entire state of West Virginia as unclassifiable/attainment. This means the entire state is considered to be fully in compliance with the 2008 ozone standard. Unlike most of the surrounding states, we will have no ozone nonattainment areas.

$PM_{2.5}$ Standard Highlights

As noted in last year's report, West Virginia has six areas that are designated nonattainment for the 1997 $PM_{2.5}$ standard. 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 significantly declined in all these areas. Based on the most recent 2009-2011 data, they all now monitor attainment of the annual standard. The improvement may primarily be attributed to emission reductions achieved by implementing 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 as well. Atmospheric modeling conducted by a consortium of southeast states indicates that these emission reductions may be largely credited for the improved air quality.

Therefore, the DAQ is moving forward with efforts to have these areas redesignated to attainment. This requires that we design maintenance plans that will ensure the areas will stay in attainment for at least 10 years after the plans are approved. The development is complicated by the number of multi-state areas (five) and lack of guidance at the federal level. One of the key control programs that help decrease future emissions (and support the maintenance plan) is the Clean Air Interstate Rule which a federal court has found to be inadequate. Further, the rule the EPA designed for its replacement has been stayed as well.

Nevertheless, the DAQ worked with adjacent states and submitted to the EPA a redesignation request/maintenance plan for the Huntington area (July 2011). We are going forward with similar efforts for Parkersburg, Weirton and Wheeling in 2012.

This means the entire state is considered to be fully in compliance with the 2008 ozone standard. Unlike most of the surrounding states, we will have no ozone nonattainment areas.

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 one-hour period. The EPA also adopted a new "form" of the standard (based on the three-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 five 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 detrimental to 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.

In a May 2011 letter to the EPA, West Virginia recommended that five counties be designated nonattainment for the new SO_2 standard, based upon certified monitoring data: Brooke, Hancock, Marshall, Monongalia and Wood. The EPA is expected to make final designations by June 3, 2013. The EPA has also issued guidance that suggests modeling should also be used to determine compliance with the SO_2 standard. If required, this is likely to require enormous agency resources.

West Virginia will then have 18 months to develop plans to bring the nonattainment areas into compliance. The plan must accomplish this within five years of the final designations.

NO_2 Standard Highlights

In a June 2011 letter to Governor Tomblin, the EPA notified West Virginia that the agency planned to designate the entire state as unclassifiable/attainment for the NO_2 standard. That means every part of the state is considered to meet the standard and no areas will be designated nonattainment.

At this time, the entire state of West Virginia is well below the thresholds of the criteria to establish NO_2 monitoring. Therefore, no monitoring for this pollutant is necessary.

Laboratory Analysis of Metals in PM

In 2011, the DAQ received an EPA grant of $170,000 to replace its Induced Coupled Plasma-Mass Spectrometer (ICP-MS) at the Guthrie Laboratory facility. The ICP-MS is used exclusively to analyze for toxic metals in particulate matter including arsenic, beryllium, cadmium, chromium, lead, manganese and nickel. Besides analyzing for the DAQ toxics monitoring sites, the ICP-MS program provides analysis for the Washington, D.C. National Air Toxics Trends Site (one of approximately 27 national trends sites) and participating EPA Region 3 agencies.

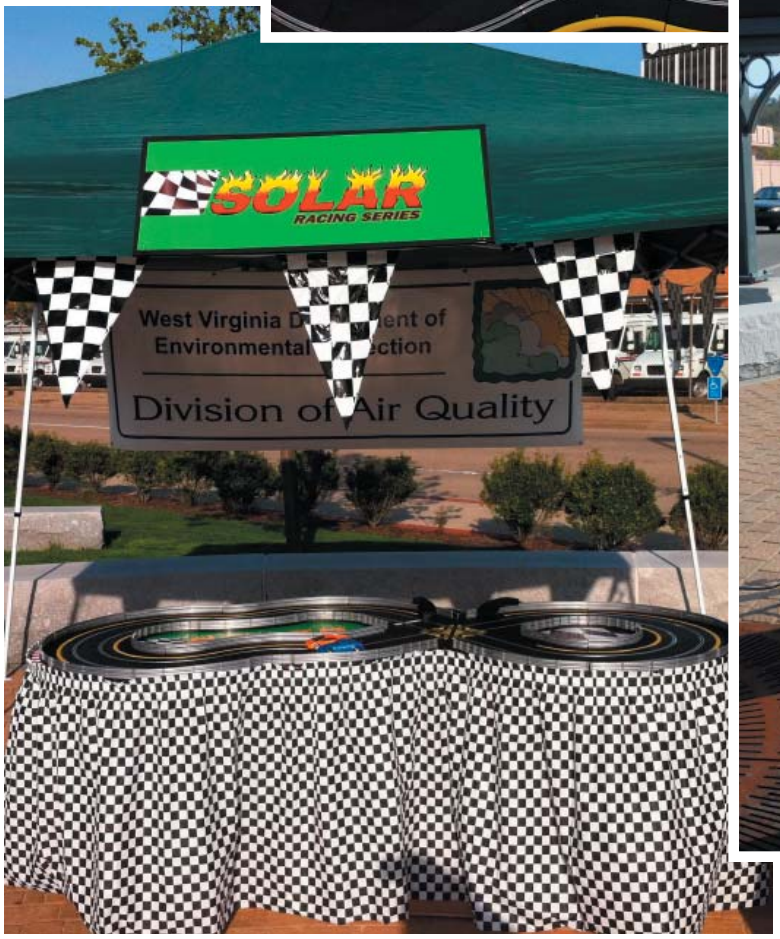
The ICP-MS is used exclusively to analyze for toxic metals in particulate matter including arsenic, beryllium, cadmium, chromium, lead, manganese and mercury.

Outreach and Education

Unlike tangible resources, air quality issues are complex and difficult to explain. Several years ago, we recognized our efforts to educate the public through conventional communication methods – brochures, posters and static displays – seemed mundane and ineffective at reaching hands-on learners. With this in mind, DAQ staff focused on developing interactive displays to attract and engage students, as well as the general public, at outreach events.

Over the years, many displays have been designed to highlight the impact our individual choices make when we use energy efficient products, and renewable and alternative energy. Our mission was to demonstrate how one can save money, create less pollution, and reduce their impact on air quality and the overall environment.

In 2011, DAQ continued its efforts to focus on alternative energy, in particular, solar. The "Solar Racing Series" was launched consisting of a figure-8 racetrack and screaming hot cars to attract youth and the "young-at-heart." The racetrack, along with the fountain are hooked up to and powered by a solar panel, which provides an opportunity to highlight the uses of solar power. When used inside, we explain how the energy is stored in the battery in the absence of direct sunlight. Visitors to our solar-powered fountain are awed by the column of cold water coming from the apparently suspended faucet.

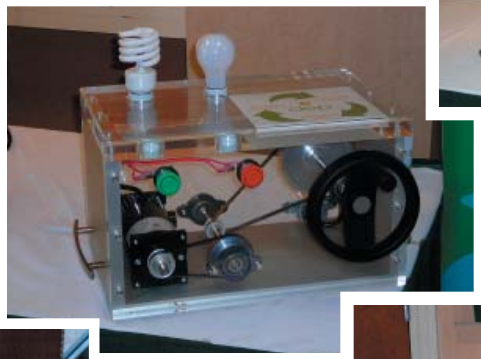


Outreach and Education

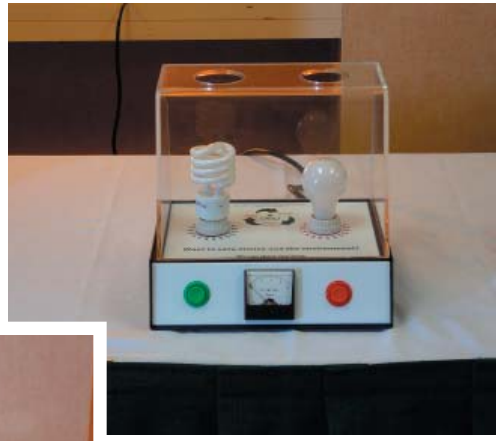
Outreach and Education

Roof Display

Crank Generator

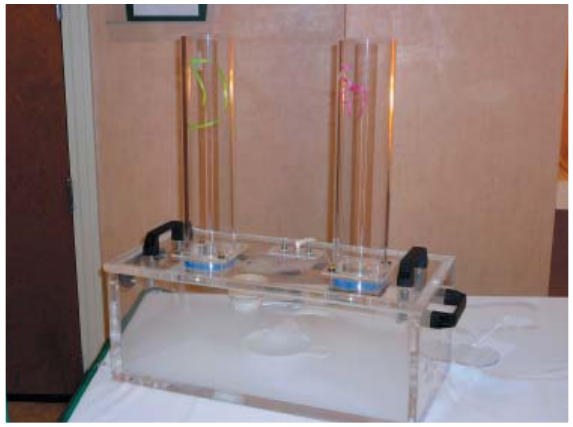


Energy Efficient House

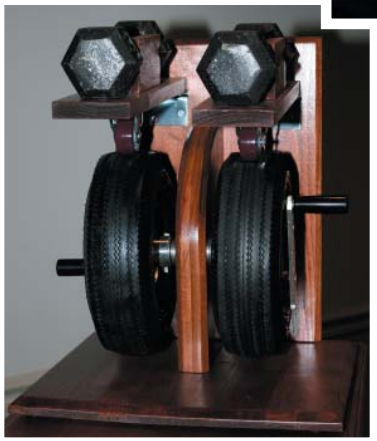


CFL Voltage Meter

Energy Efficient Window Display

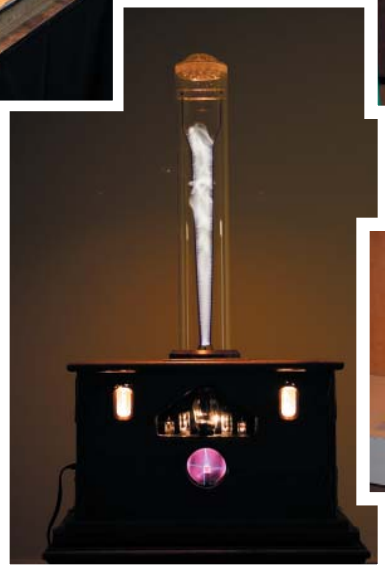


Smoke Generator



Tire Air Pressure Display

Jacobs Ladder



CFL Display

Wind Turbine Diarama

Small Business Assistance Program

The DAQ's Small Business Assistance Program (SBAP) followed up on a previous outreach to metal fabrication shops that were affected by a new federal rule which targeted "Nine Metal Fabrication and Finishing Area Source Categories," a sector that had not previously been affected by specific air quality regulations in West Virginia. To this end, a poster outlining the best management practices of the metal fabricator area source rule (Subpart 6X) was produced and distributed. This poster was yet another in a series of posters produced by the SBAP to educate facilities and encourage compliance across a broad range of media. These posters include the following:

- Asbestos Rule Awareness
- Used Oil Disposal
- Garage Hazardous Waste Bulletin
- Metal Fabricators Best Management Practices
- Metal Fabricators Solvent Recycler

The last poster in this series is also a new SBAP-produced poster designed to encourage sources that paint or coat metal parts to utilize a solvent recycler. If throughputs of solvent warrant purchase of such a recycler, the facility can pay for the purchase in as little as one year. From that point on, the facility will continue to save money from decreased solvent purchase costs, as well as reduced costs in hauling off the spent solvent as a hazardous waste. It is a win-win situation, more money for small businesses and a cleaner environment!

The 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 industry and the DAQ Enforcement Section.

Ozone (O_3)

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 technically advanced than our state monitoring system.

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.

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 categories of 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.

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.

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 and air emissions. 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 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 the EPA, ozone exposure may also contribute to premature death, especially in people with heart and lung disease.

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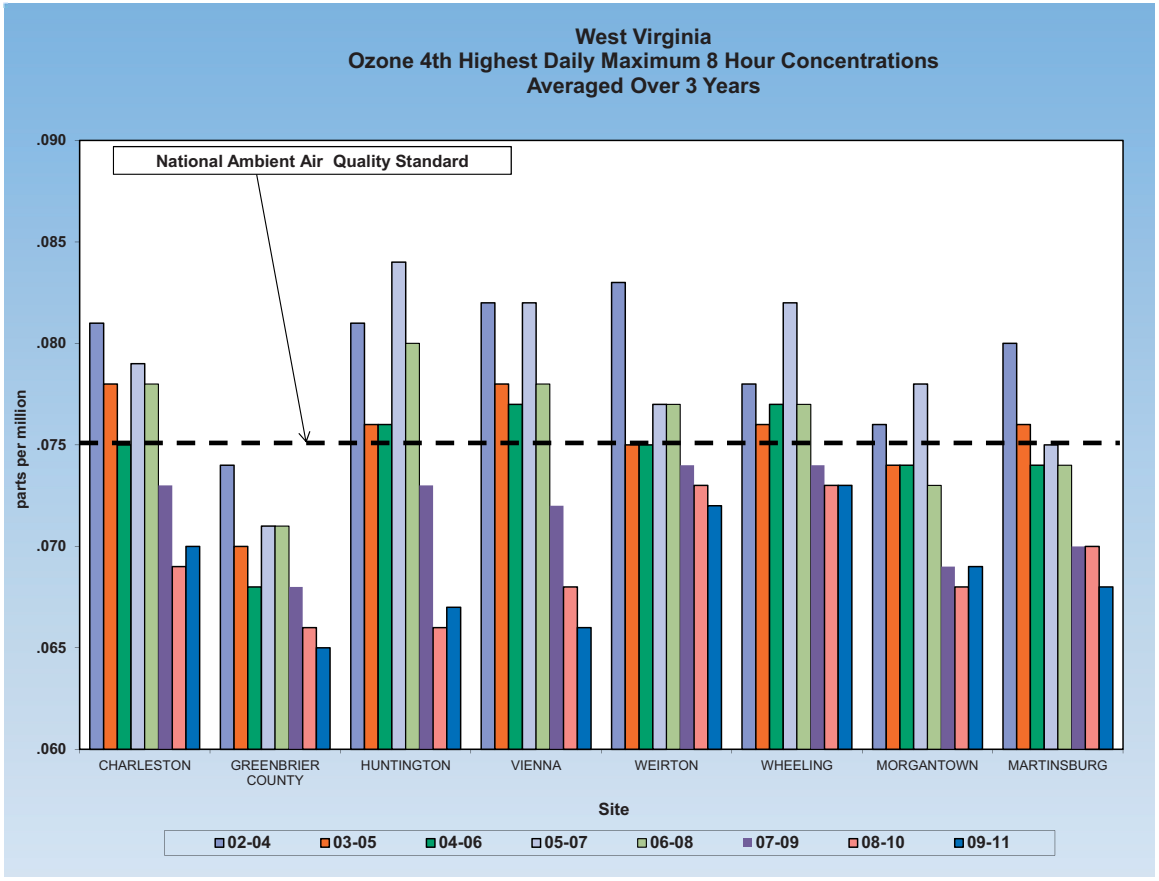


Particulate Matter (PM_{10}) Less than 10 microns in diameter

Particulate matter (PM) consists of 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 aggregate 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.

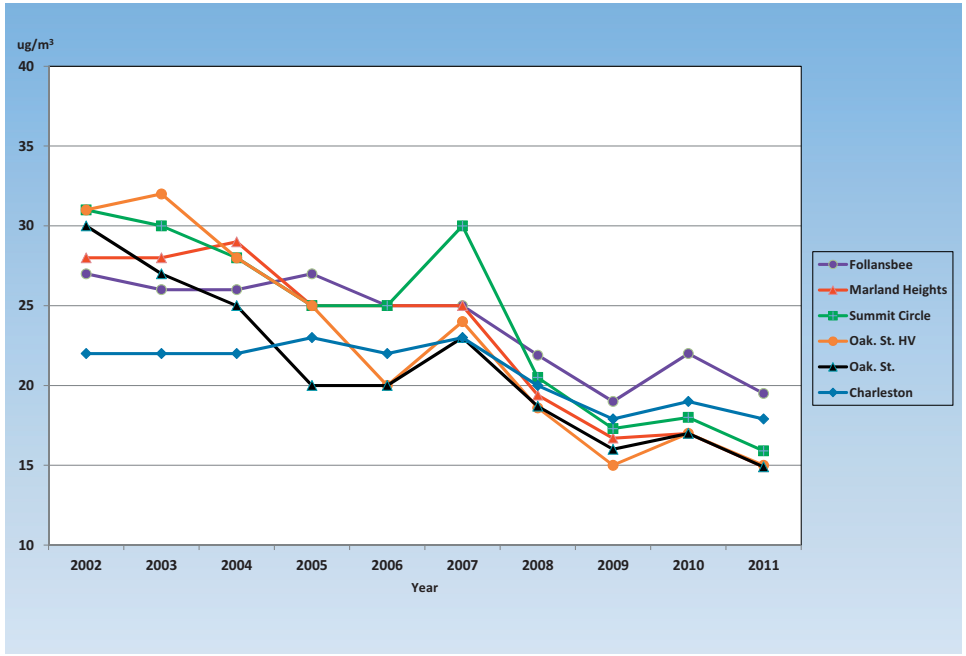
Because of these differences, the EPA maintains two separate ambient air quality standards for particulate matter. One standard addresses PM_{10} particles that are relatively coarse, but equal to or less than 10 micrometers in diameter. The other standard addresses levels of fine particulate matter (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 invade 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 federal agency has determined that the short-term 24-hour standard makes the annual standard unnecessary.

The Division of Air Quality's monitoring network measures PM_{10} at five sites in three counties across West Virginia.

The DAQ's monitoring network measures PM_{10} at five sites in three 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.

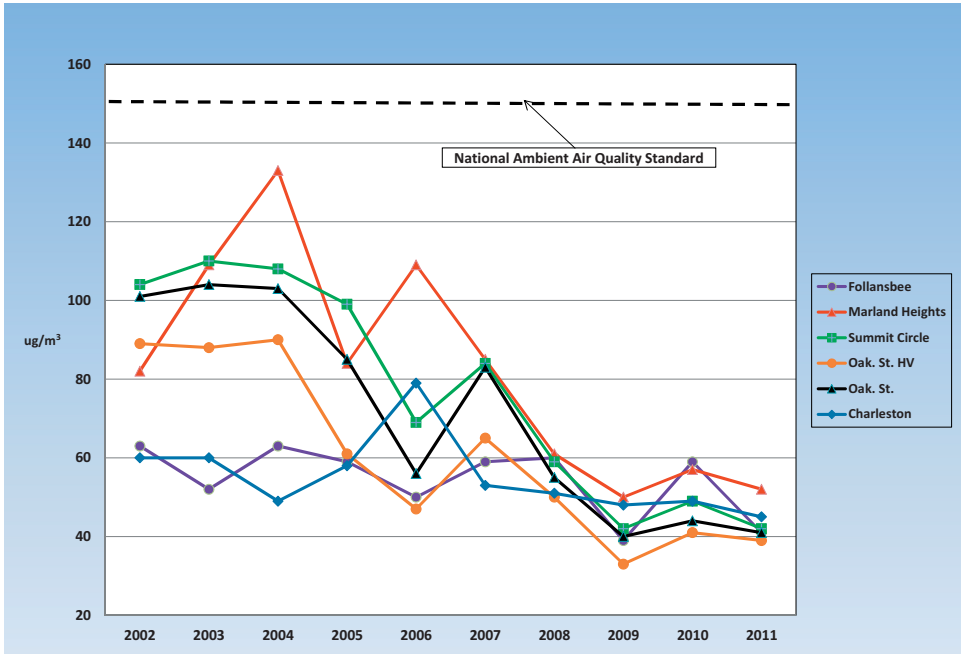
A historical summary of monitored PM_{10} data is located on page 11.

Particulate Matter (PM_{10})



West Virginia
PM_{10}
Annual Trends

West Virginia
PM_{10}
24-Hour 2nd Maximum



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 2011. 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 $PM_{2.5}$ non-attainment areas, as published by the EPA on April 5, 2005, for the state are shown in the chart on page 13. 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 13. 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 14. Notably, $PM_{2.5}$ concentrations have improved such that during 2009-2011, 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, continue to meet the 24-hour $PM_{2.5}$ standard for the period 2009-2011. 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 was returned to the Moundsville site in 2011. 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 37 and 38.

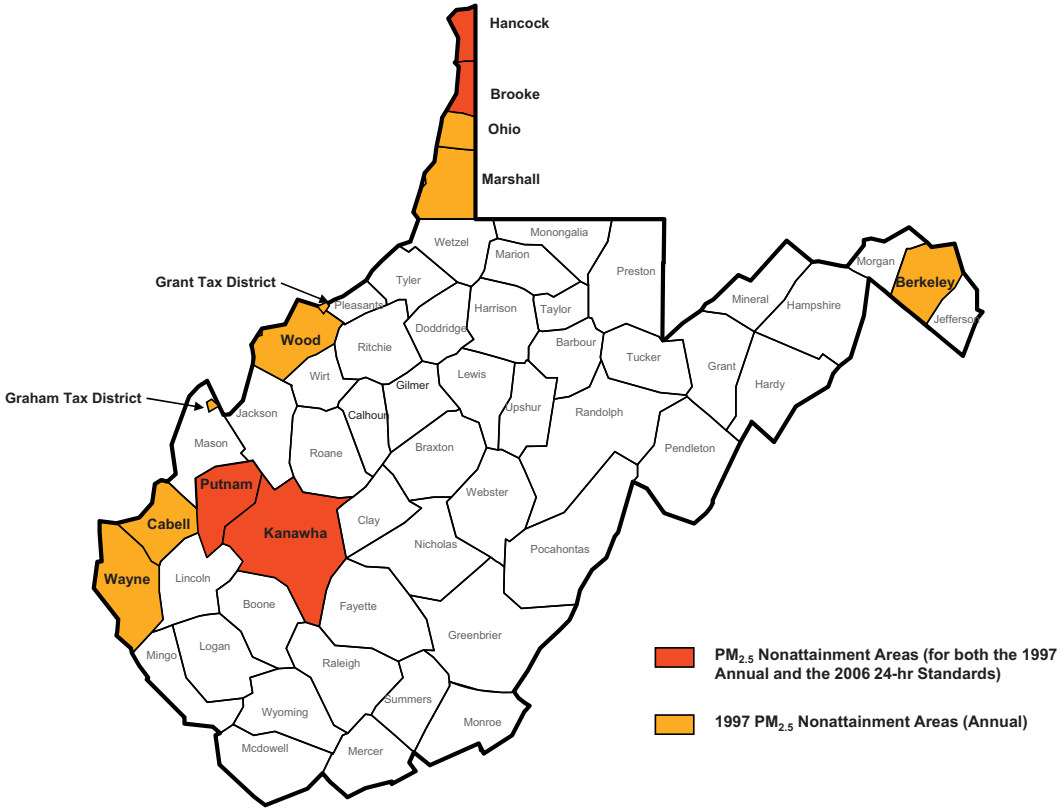
As a result of further research, it was determined that very fine particles in the 2.5 microns diameter and less size range have the most adverse effects on human health.

Particulate Matter ($PM_{2.5}$)

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.

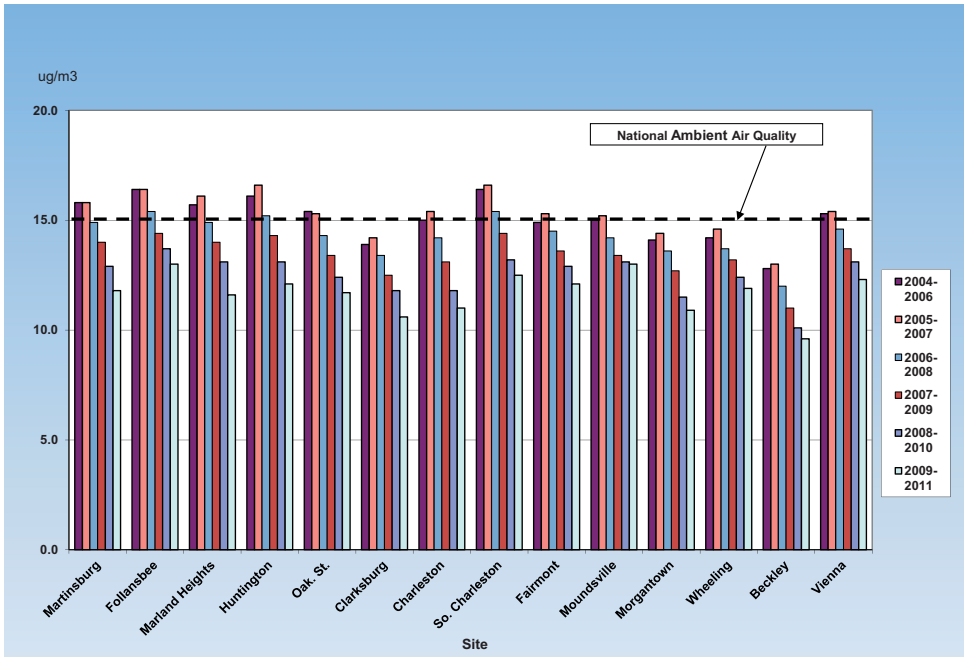
Steubenville, Ohio, Weirton, W.Va. MSA*
- including Brooke and Hancock counties, W.Va.

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.

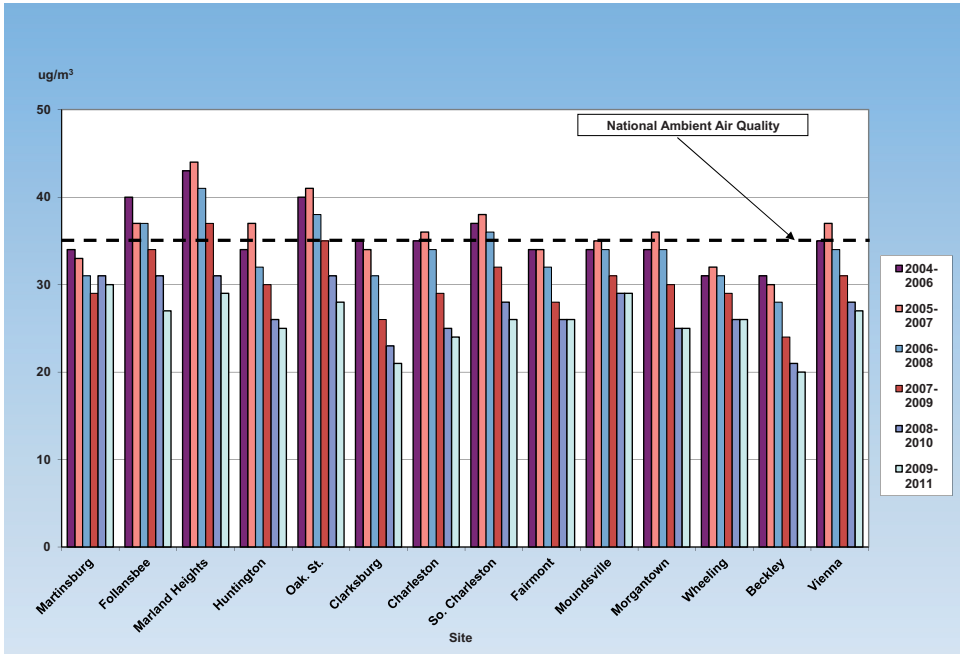
***Metropolitan Statistical Area**
****1997 Annual $PM_{2.5}$ Standard**

Particulate Matter ($PM_{2.5}$)



West Virginia
$PM_{2.5}$
Annual Averages
Averaged Over 3 Years

West Virginia
$PM_{2.5}$
24-Hour 98%
Averaged Over 3 Years



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.

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 five 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.

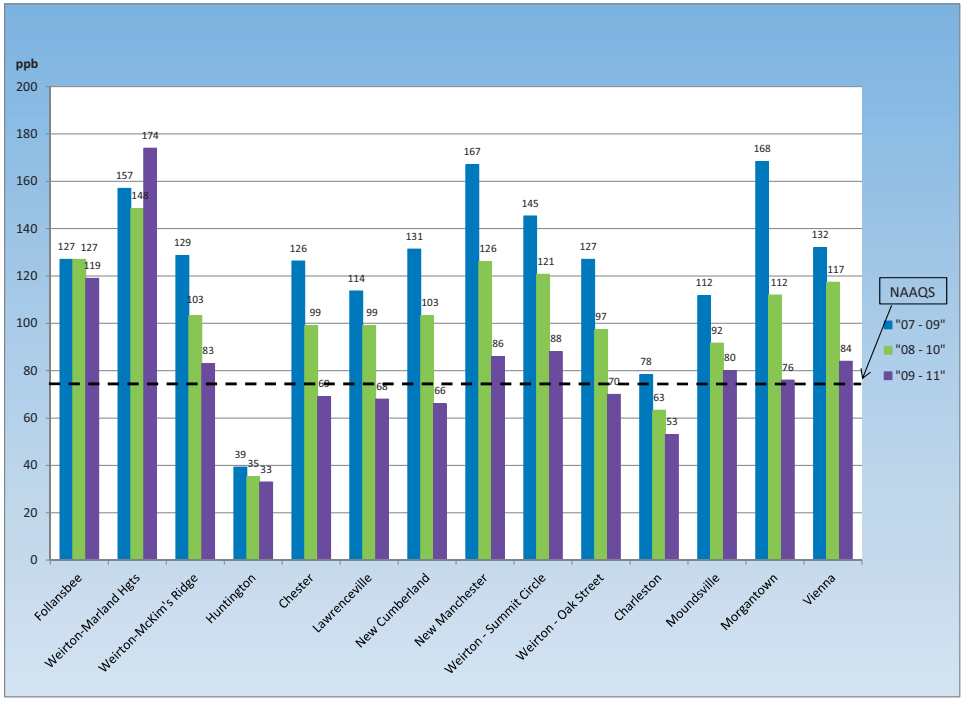
SO_2 can also react with other compounds in the atmosphere to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death.

The chart on page 16 shows how the monitoring sites compare to the new one-hour SO_2 standard. The one-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 three-hour SO_2 values have declined, the data shows that most sites are now above the more stringent one-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.

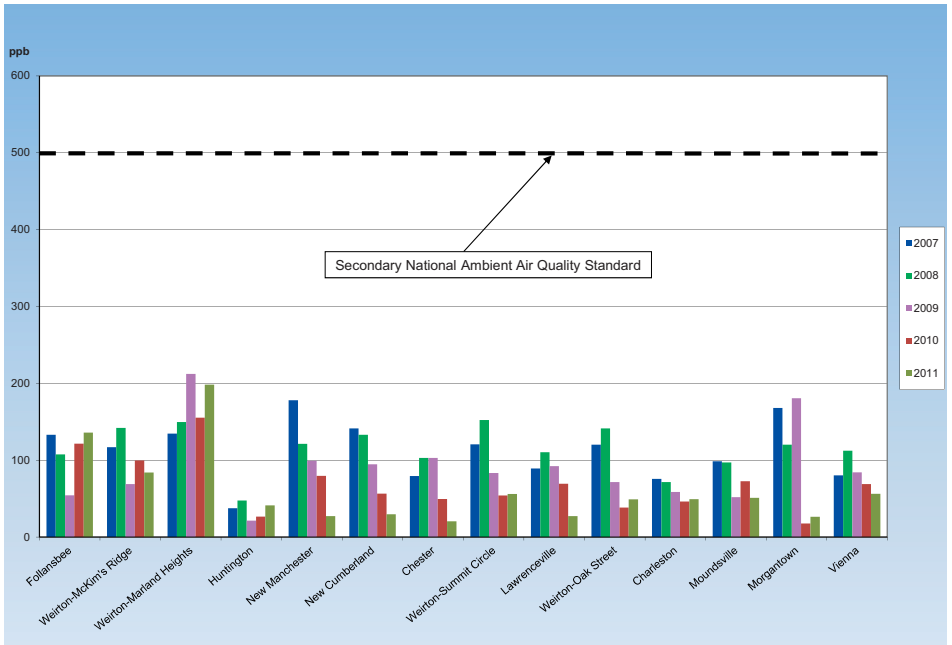
The main sources of SO_2 are combustion of coal and oil, refineries, smelters and industrial boilers. Nationally, two-thirds of all SO_2 emissions are from power plants.

Sulfur Dioxide (SO_2)



West Virginia
SO_2
3 Year 99% Daily 1-Hour
Max Averages
(NAAQS = 75 ppb)

West Virginia
SO_2
3-Hour 2nd Max Concentrations



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 ppb 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.

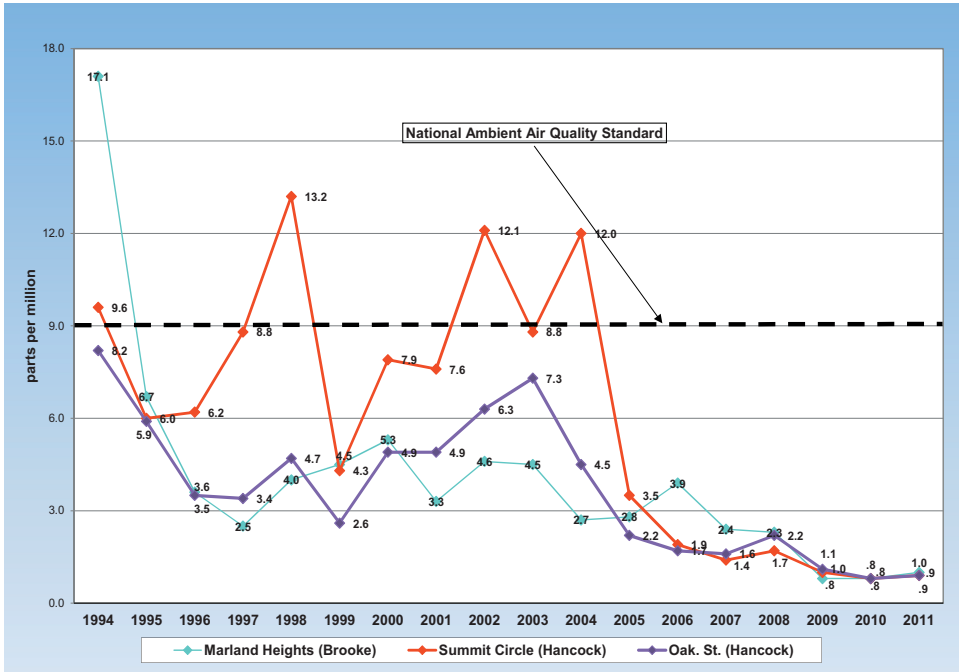
In August 2011, the EPA issued a decision to retain the existing NAAQS for carbon monoxide. The EPA concluded that the current standards provide the required level of public health protection, including protection for people with heart disease, who are especially susceptible to health problems associated with exposures to CO in ambient air. There are no secondary (welfare-based) NAAQS for CO due to a lack of evidence of direct effects on public welfare at ambient concentrations. Two Hancock County and one Brooke County monitoring sites measured carbon monoxide levels through 2011. In 2011, all sites reported levels below the one-hour and eight-hour standards.

The EPA is revising minimum requirements for CO monitoring by requiring CO monitors to be sited near roads in certain urban areas. Specifically, the EPA is requiring the collocation of one CO monitor with a "near-road" NO_2 monitor in urban areas having populations of 1 million or more. Also, the EPA is specifying that monitors required in Core Based Statistical Areas (CBSA's) of 2.5 million or more persons are to be operational by January 1, 2015. Those monitors required in CBSAs having 1 million or more persons are required to be operational by January 1, 2017. West Virginia does not have any areas that trigger these "near-road" monitoring requirements.

A historical summary of monitored CO data is located on page 18.

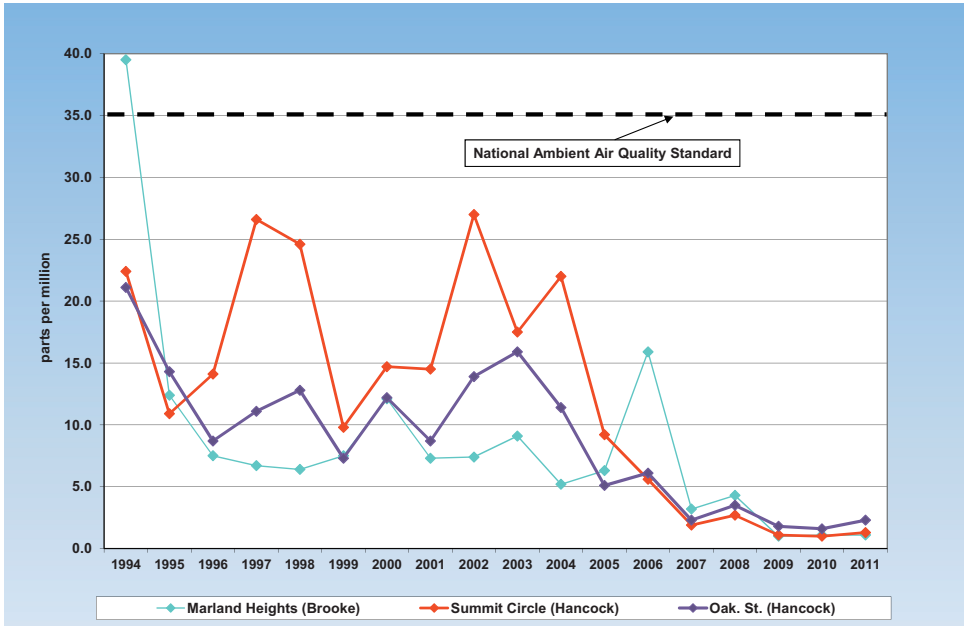
The primary source of carbon monoxide is the exhaust from motor vehicles, which includes highway and non-road vehicles, such as construction equipment.

Carbon Monoxide (CO)



West Virginia
CO
(8-Hour standard = 9.0 ppm)
2nd Highest Concentration

West Virginia
CO
(1-Hour standard = 35.0 ppm)
2nd Highest Concentration



Lead (Pb)

The EPA tightened the lead standard in 2008, making it 10 times more stringent than the previous standard. The agency revised the primary standard from1.5 micrograms per cubic meter to 0.15 µg/m3. In a June 2011 letter to Governor Tomblin, the EPA notified West Virginia that the agency planned to designate the entire state as unclassifiable/ attainment, meaning the whole state is considered to be meeting the lead standard. This designation was finalized in a Federal Register notice published November 2011 [76 FR 72097].

In December 2010, the EPA changed the emission threshold that state monitoring agencies must use to determine if an air quality monitor should be placed near an industrial facility that emits lead. The new emission threshold is 0.5 tons per year (tpy), reduced from the previous threshold of 1.0 tpy. As a result of this change, the DAQ plans to install and operate a lead monitor in 2012 at an existing monitoring site in Huntington, WV.

The EPA is also requiring monitors to be placed at airports that emit one 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.

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.

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.

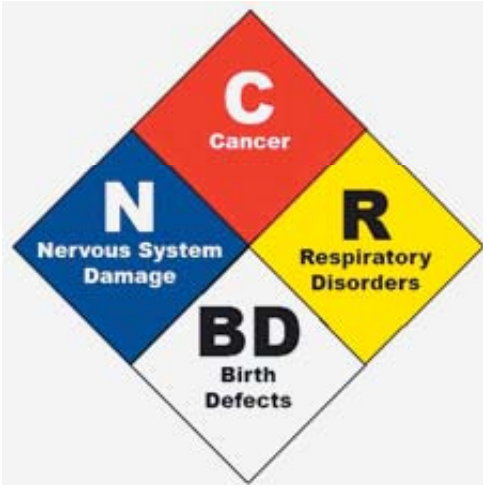
Criteria Pollutants

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

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.



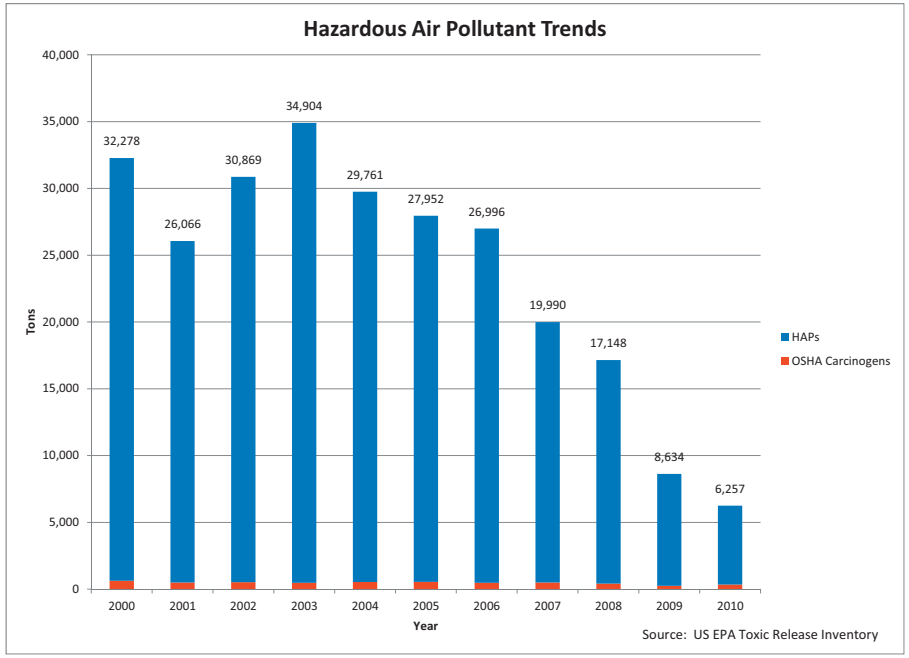
Since 1993, the EPA has issued nearly 100 MACT standards covering close to 200 categories of large industrial sources. Additionally, there are a number of air toxics standards for smaller facilities, including older standards for dry cleaners, chromium electroplaters, secondary aluminum producers, and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

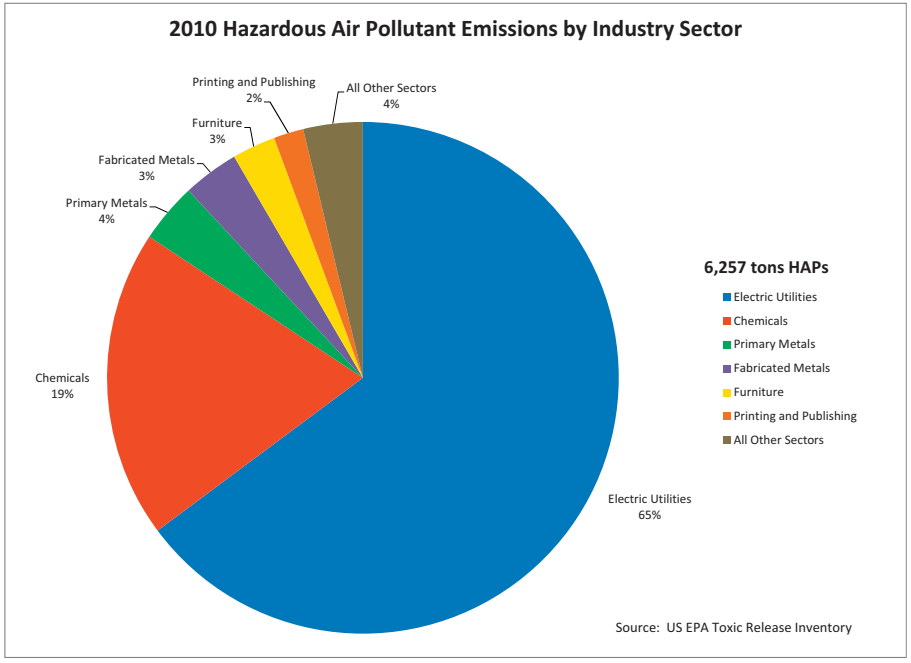
Air toxics emissions have decreased significantly in recent years due to the implementation of federal standards. As shown in the bar chart on page 22, HAPs continue to be reduced as the dates for complying with each of these standards for large and small facilities arrive. As a result, West Virginians 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 23, 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 2009 to 2010 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.

Air toxics emissions have decreased significantly in recent years due to the implementation of federal standards.

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 is posted to EPA’s website: (www.epa.gov/ttn/atw/natamain/).

Air Toxics


Hazardous Air Pollutant Trends
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Tons
32,278
26,066
30,869
34,904
29,761
27,952
26,996
19,990
17,148
8,634
6,257
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Year
HAPs
OSHA Carcinogens
Source: US EPA Toxic Release Inventory


2010 Hazardous Air Pollutant Emissions by Industry Sector
Printing and Publishing 2%
All Other Sectors 4%
Furniture 3%
Fabricated Metals 3%
Primary Metals 4%
Chemicals 19%
Electric Utilities 65%
6,257 tons HAPs
Electric Utilities
Chemicals
Primary Metals
Fabricated Metals
Furniture
Printing and Publishing
All Other Sectors
Source: US EPA Toxic Release Inventory

Air Toxics

Air Toxics Monitoring

DAQ operates a network of air toxics monitors to fulfill a variety of programmatic goals, including periodic special projects in specific areas. 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, and given periodic problems with some of the equipment, historical trend analysis of long-term ambient air toxics is problematic. Additionally, there are 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.

Air 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 seven new hybrid electric diesel buses began operations in the Charleston and Huntington metro areas in November 2009, and have already been proven to use less diesel fuel than their conventional counterparts. These buses serve as a visible reminder of clean technology in our communities.

In 2010 and 2011 the DAQ collaborated with the public school system. The DAQ partnered with Greenbrier County Schools and the Fayette County Board of Education to help provide funding to replace older buses with new, cleaner buses. The cost of the new school buses was offset with assistance from the DAQ as part of the EPA's National Clean Diesel Campaign funding. Another project has been working with the West Virginia Division of Highways on a pilot project to replace an old dump truck with a vehicle meeting newest available EPA emissions standards ahead of fleet turnover in order to work out logistical and operational issues.

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/.

The DAQ partnered with Greenbrier County Schools and the Fayette County Board of Education to help provide funding to replace older buses with new, cleaner buses.

Air Quality Index

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 one-hour SO_2 standard for those sites that monitor SO_2. The revised SO_2 AQI has increased the number of days in the Unhealthy 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.

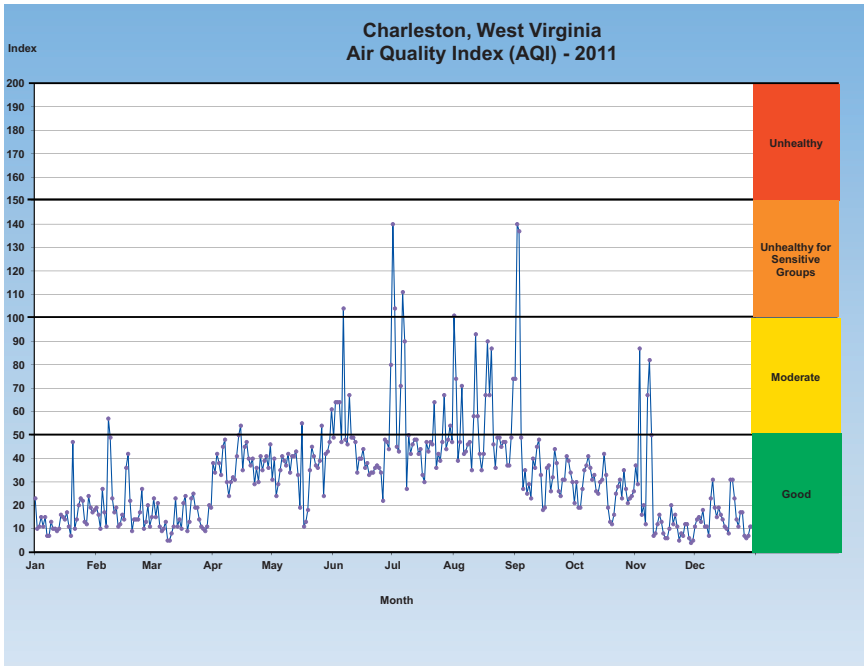
The AQI for nine areas in WV can be accessed by going to www.dep.wv.gov/daq and clicking on the AQI icon

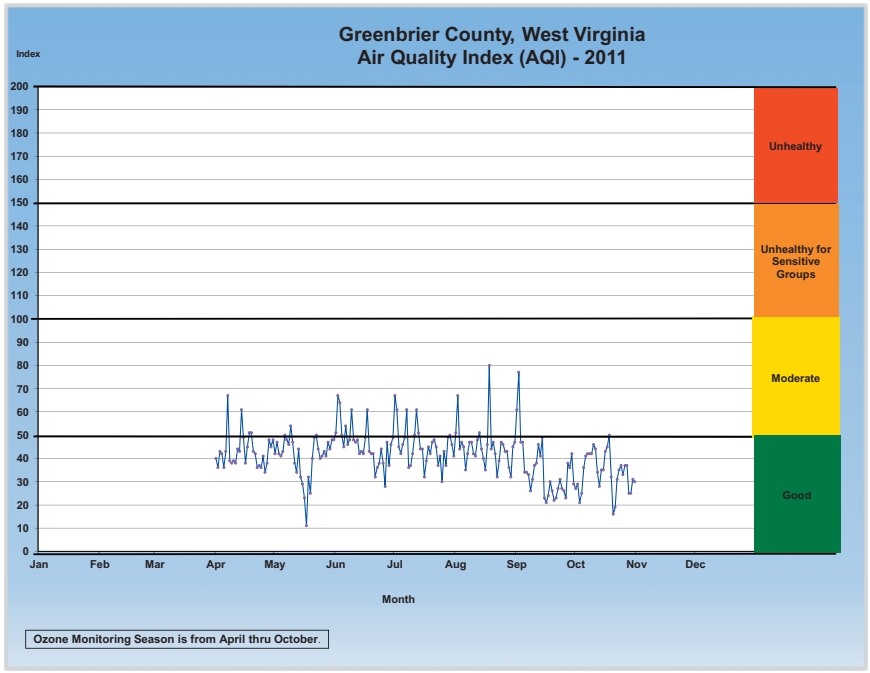
Air Quality Index

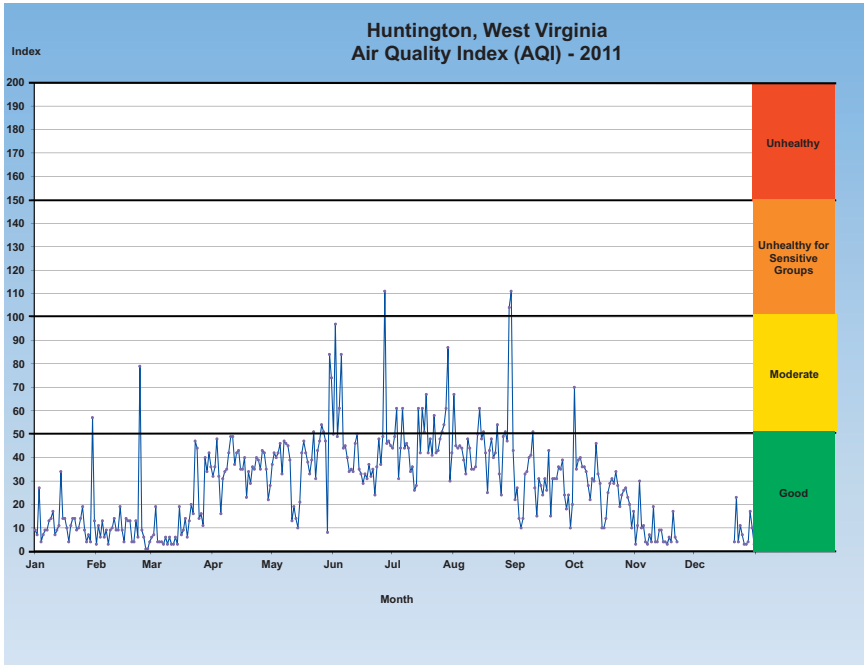
Location	Highest AQI Value	2011 - Days in each category:				Pollutants Considered
		Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	
Charleston	140	329	29	7	0	SO_2, O_3, PM_{10}
Greenbrier County	80	192	22	0	0	O_3
Huntington	111	306	28	3	0	SO_2, O_3
Martinsburg	90	189	25	0	0	O_3
Morgantown	101	347	16	1	0	SO_2, O_3
Moundsville	119	276	71	4	0	SO_2, $PM_{2.5}$
Vienna	122	296	32	3	0	SO_2, O_3
Weirton	111	307	56	2	0	CO, SO_2, O_3, PM_{10}
Wheeling	106	171	42	1	0	O_3

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.

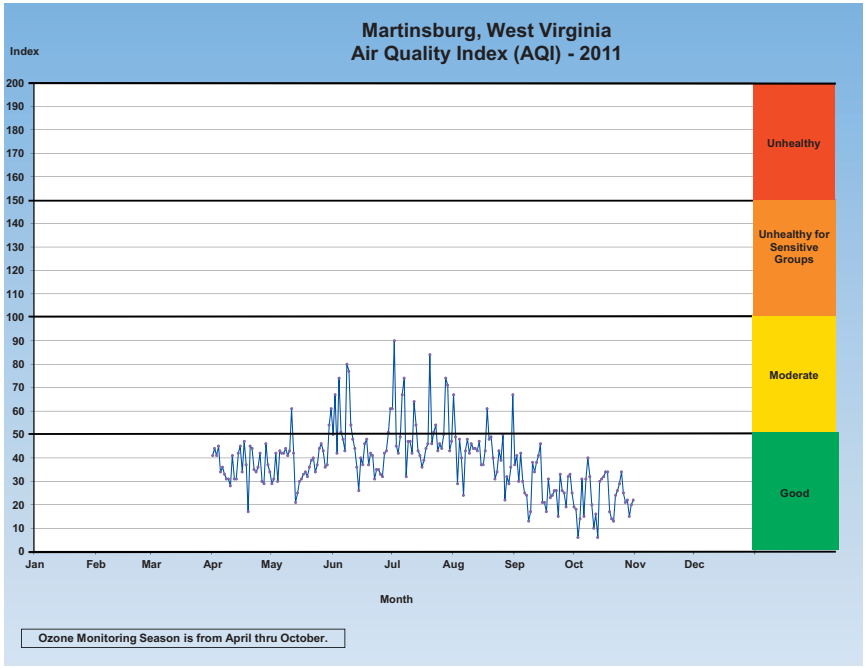
Air Quality Index (AQI) Data

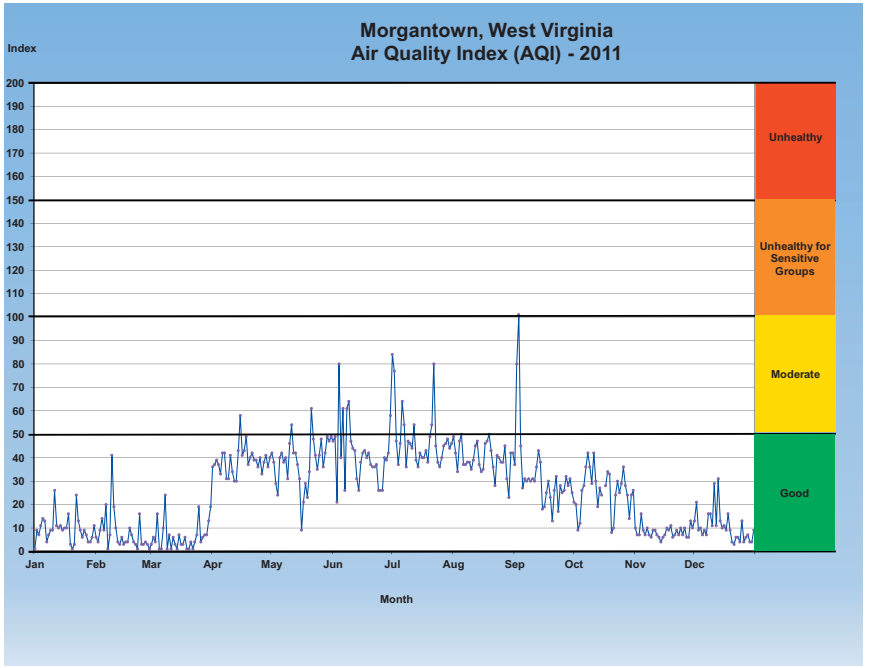


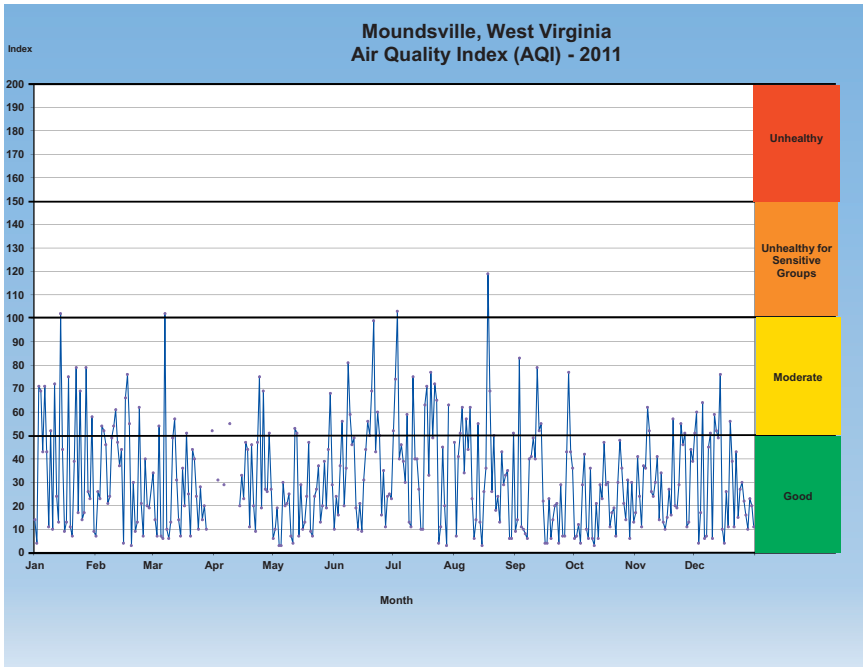




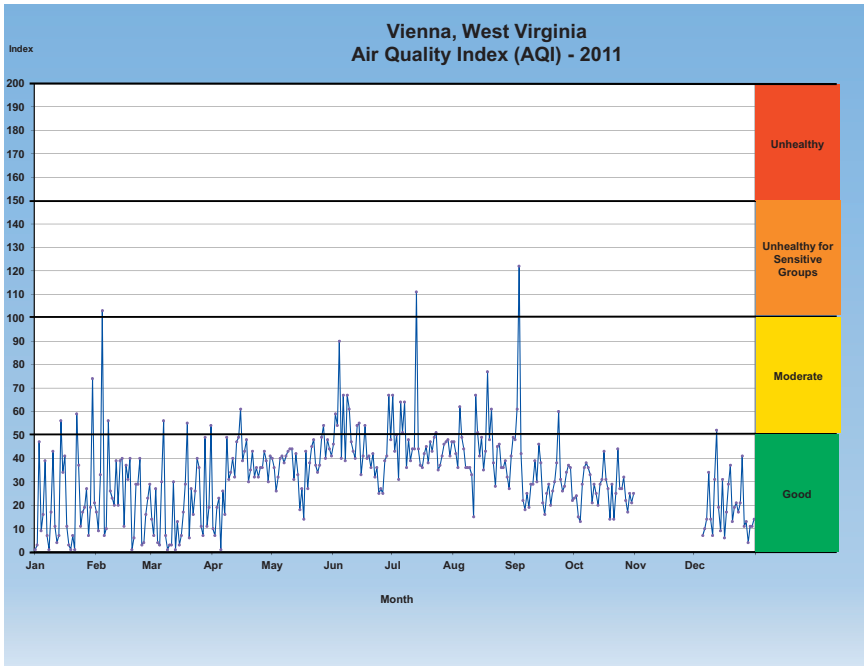
Air Quality Index (AQI) Data

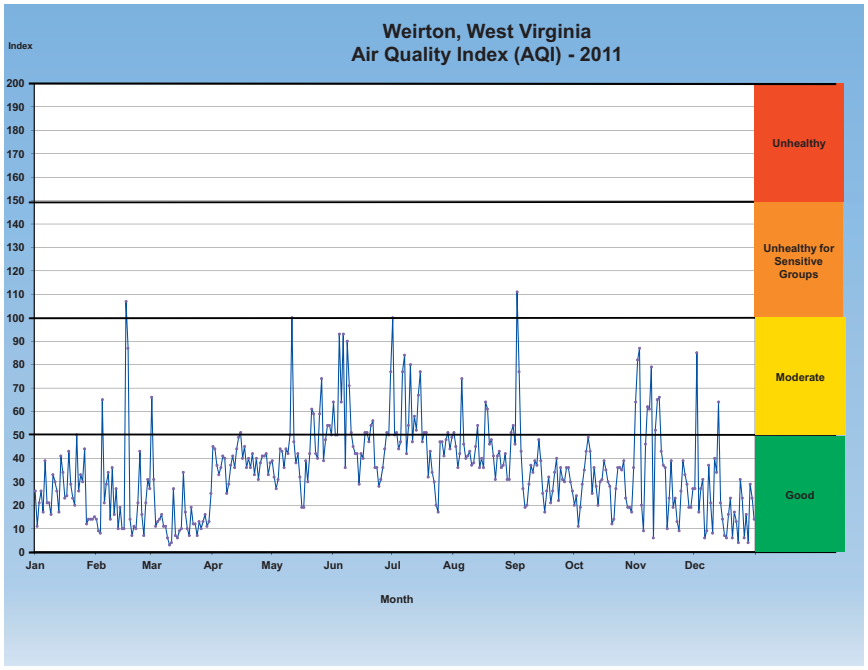


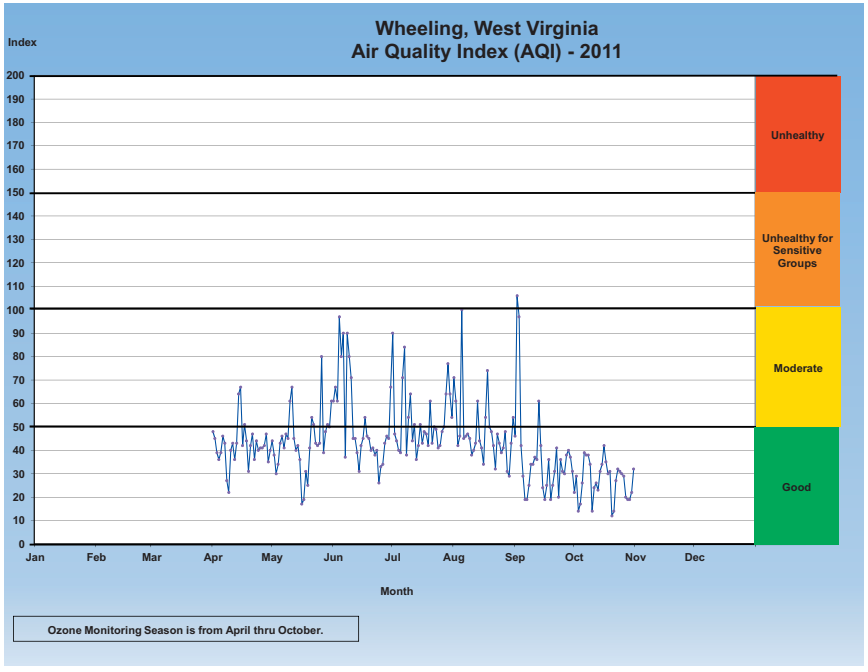




Air Quality Index (AQI) Data

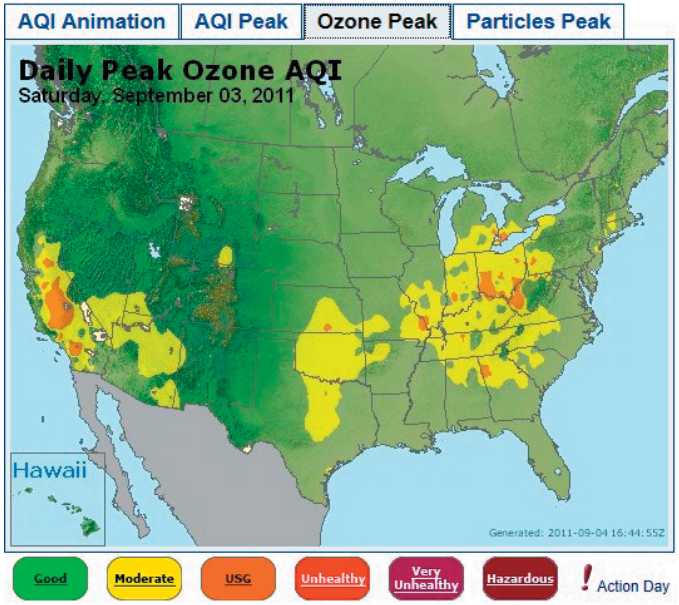






Air Quality Index (AQI) Data

Ozone (O_3): 8-Hour Peak



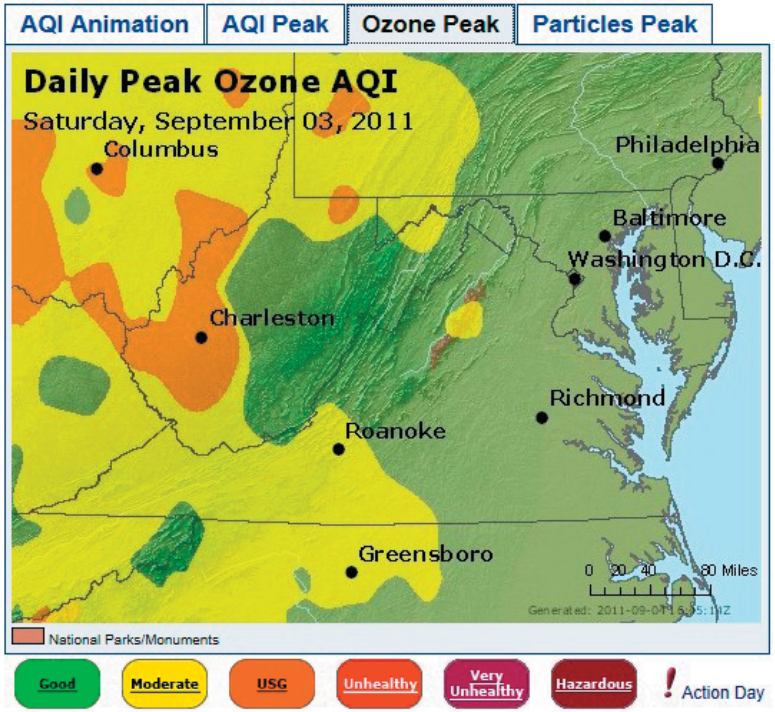
The following maps are from EPA's AirNow network, www.airnow.gov. The website was developed to provide the public with easy access to national air quality information. The network provides an hourly update for ozone data from 9 a.m. to 9 p.m. from May through September, and on a year-round basis for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

Meteorological factors like wind speed and direction, and ambient temperatures play a role in forming ozone. 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.
The National Oceanic and Atmospheric Administration (NOAA) has been recording climate records since 1880. Globally, summer 2011 (June – August) was the seventh warmest such period on record. Regionally, ambient temperatures in both the summer months and, specifically, August 2011 were the second warmest on record. In August, the average temperatures across West Virginia were in the mid-80s.

Temperatures continued to rise and on September 3, 2011, monitoring stations in the western part of our state recorded air quality index (AQI) values for ozone in the "unhealthy for sensitive groups" category. The increase in ozone level was affected by the continued warm temperatures, lower than normal precipitation, and minimal winds.

Many urban areas tend to have high levels of ozone, but even rural areas are subject to increased levels because atmospheric circulation and wind carry ozone, and pollutants that form it, hundreds of miles away from their original sources.

Ozone (O_3): 8-Hour Peak

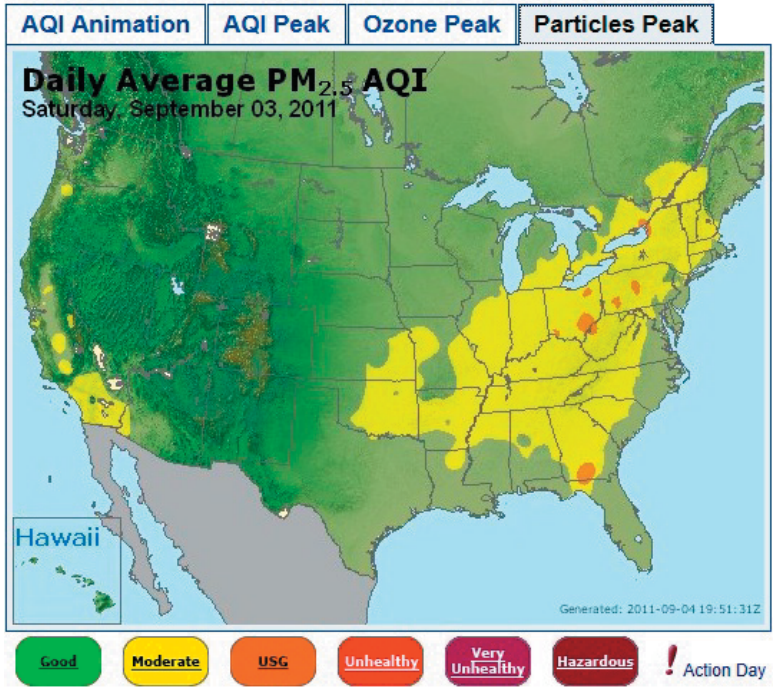


The close-up section map for September 3, 2011 shows the air quality index (AQI) values for ozone in a large part of the western section of West Virginia at the “unhealthy for sensitive groups” level.

Higher than average temperatures in the preceding month, along with upper-90s temperatures on September 3, resulted in a spike in the ozone level. The persistent high temperatures, minimal precipitation, and limited wind movement may have contributed to the higher ozone value. 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 season runs from April 1 – October 31.

Children tend to be more active outdoors during the summer months, increasing the risk from exposure to ozone. Since their lungs are still developing, increased exposure to elevated levels of ozone increases the risks for respiratory symptoms.

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

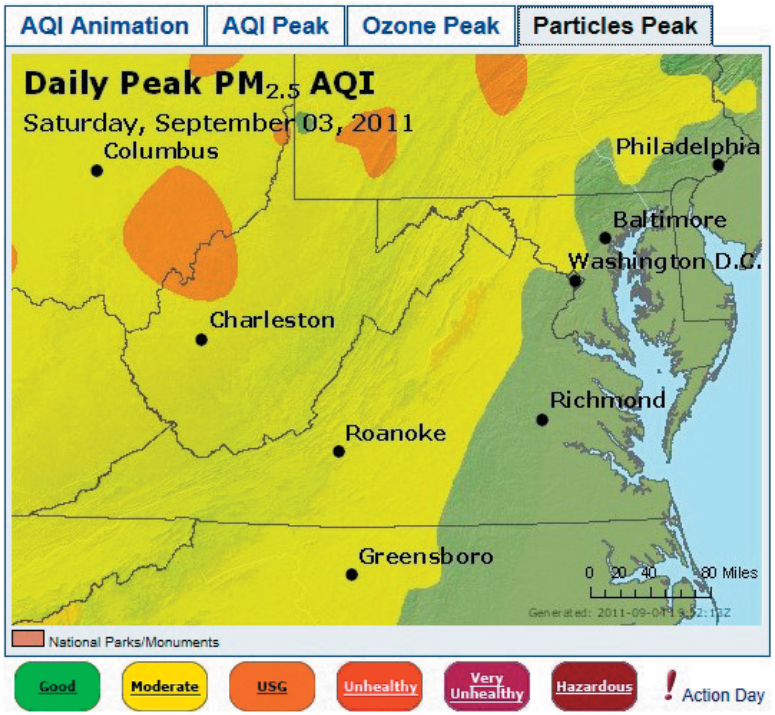


The national map for September 3, 2011 from EPA's Air NOW network, www.airnow.gov, shows one-hour $PM_{2.5}$ peak values for most of the East coast at the "moderate" level except for a few concentrated areas around West Virginia and neighboring states, Ohio and Pennsylvania.

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

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.

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



This map of West Virginia and neighboring states indicate AQI levels in mostly the "Moderate" category for the 1-hour peak value on September 3, 2011. The mapping is based on $PM_{2.5}$ continuous monitors. Data gathered for the three-year period from 2009 to 2011, and averaged over those three years, show a downward trend in 24-hour $PM_{2.5}$ values across West Virginia.

Sources of these particles include both man-made such as construction sites, unpaved roads, and smokestacks, as well as natural sources. Wildfires also can contribute to high levels of particle emissions. These particles are often carried over long distances by wind and then settle on ground or water. In 2011, drought conditions and multiple wildfires in Texas came on the heels of a wildfire in Arizona, the largest in that state's history. Exposure to such fine particles can affect both your lungs and your heart because they can get deep into your lungs, and some even into your bloodstream.

Appendix A
Technical Information
Ambient Monitoring

West Virginia Division of Air Quality - Monitoring Network

CY 2011

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			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

* Monitoring moved from Warwood (data as of 8/13/2011) to Moundsville (monitoring started 8/19/2011)

2011 Criteria Pollutants Summary

Ozone

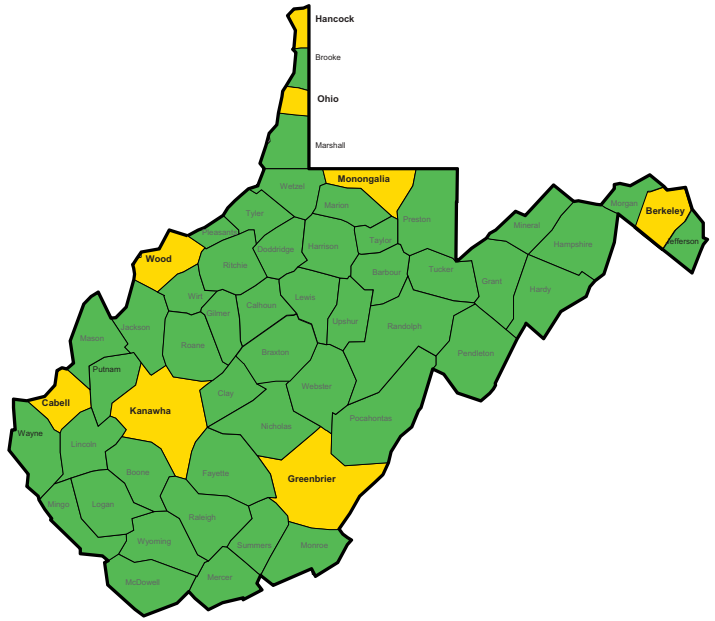
Criteria Pollutant Summary Report - 2011

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	'09-'11 4th Max Avg
Berkeley	Martinsburg	54-003-0003	212	0	.072	.070	.069	.068	.068
Cabell	Huntington	54-011-0006	210	3	.080	.080	.077	.074	.067
Greenbrier	Sam Black Church	54-025-0003	208	0	.069	.065	.065	.065	.065
Hancock	Weirton	54-029-1004	205	1	.080	.075	.075	.073	.072
Kanawha	Charleston	54-039-0010	206	7	.091	.091	.090	.080	.070
Monongalia	Morgantown	54-061-0003	204	1	.076	.070	.069	.069	.069
Ohio	Wheeling	54-069-0010	214	1	.078	.075	.074	.074	.073
Wood	Vienna	54-107-1002	202	1	.084	.072	.068	.065	.066

Particulate Matter (PM_{10})

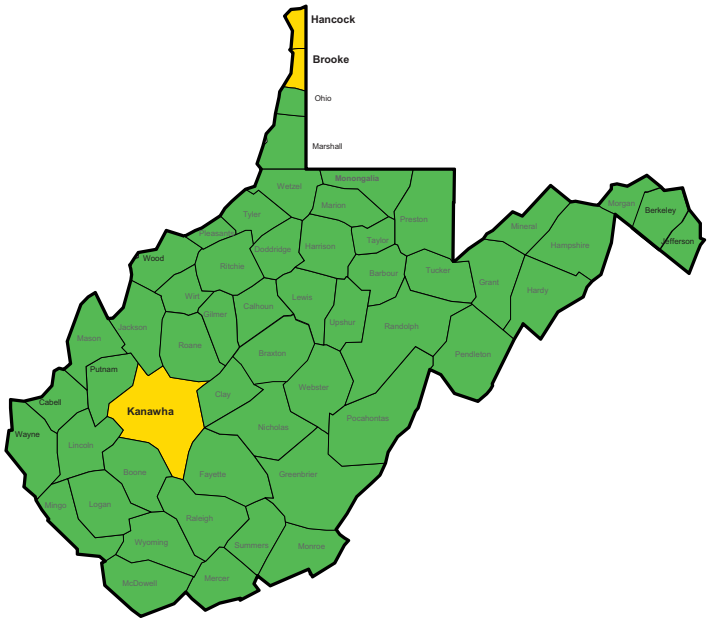
Criteria Pollutant Summary Report - 2011

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	121	19.5	0	42	41	39	39
Brooke	Weirton	54-009-0011	5773	14.9	0	72	52	52	50
Hancock	Weirton	54-029-0009	8575	15.9	0	46	42	41	41
Hancock	Weirton	54-029-1004	59	15.0	0	39	39	34	32
Hancock	Weirton	54-029-1004	8478	14.9	0	44	41	41	39
Kanawha	Charleston	54-039-0010	6707	17.9	0	51	45	45	45

Particulate Matter ($PM_{2.5}$)

Criteria Pollutant Summary Report - 2011

Pollutant: Particulate Matter $PM_{2.5}$

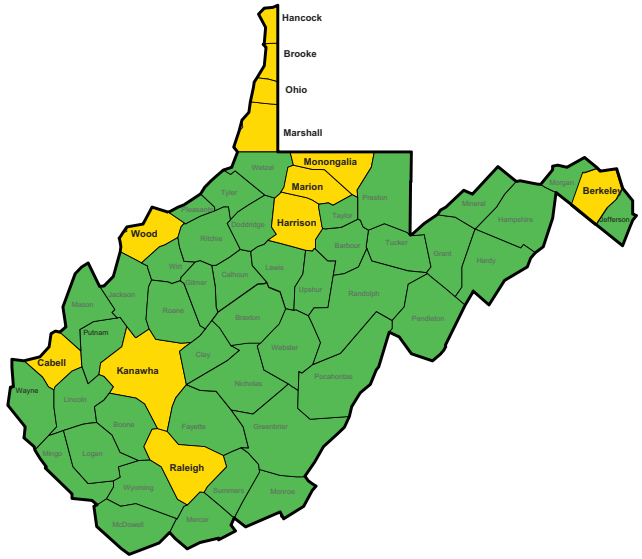
Monitoring Season: January 1 - December 31
Data Interval: 24-Hour
Units: Micro-grams per cubic meter (ug/m^3)

National Ambient Air Quality Standards (NAAQS)

Primary NAAQS: Annual Arithmetic Mean (3yr average) 15.0 ug/m^3

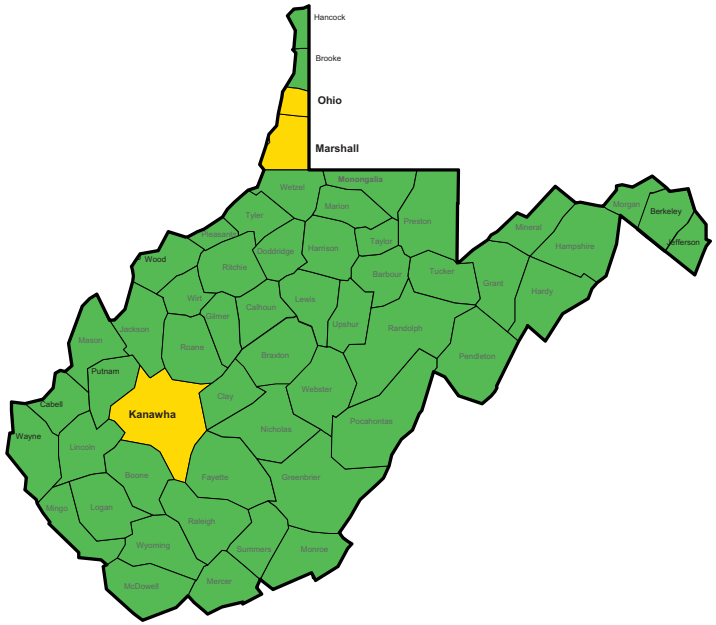
24-Hour Average 35 ug/m^3
(3yr average 98th percentile)

Secondary NAAQS: Same as Primary Standard

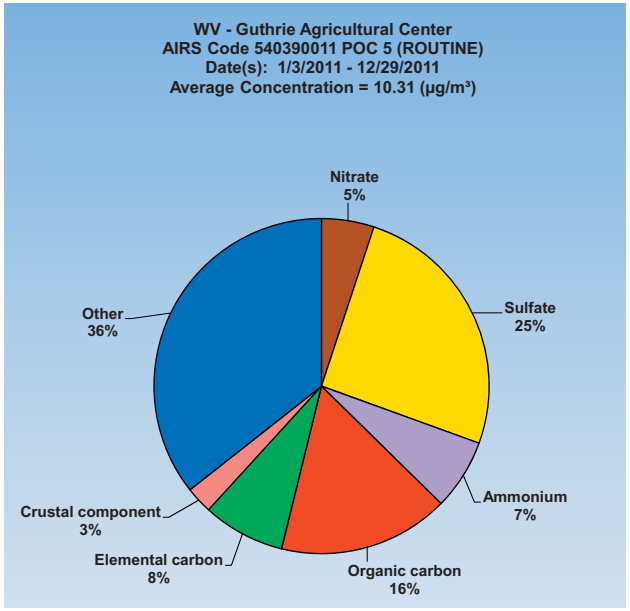


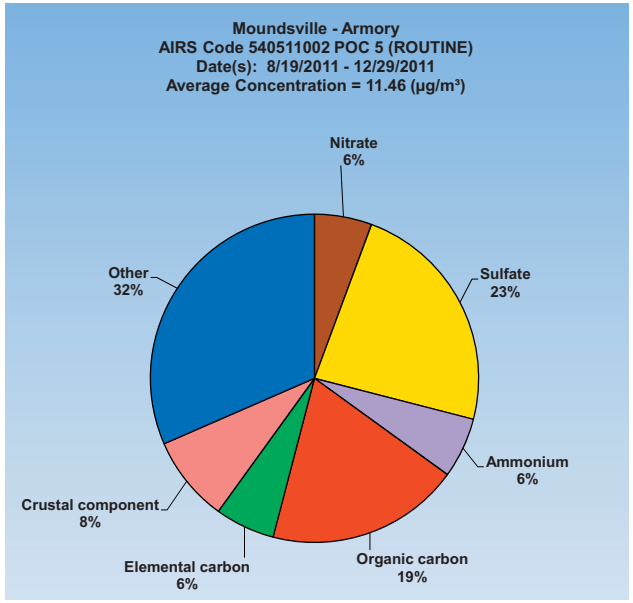
County	Site	EPA-ID	# Obs	Annual Mean	24-Hour Average				3 Year Average	
					Obs > 35	98%	1st Max	2nd Max	Annual	24-Hr 98%
Berkeley	Martinsburg	54-003-0003	120	11.1	0	27.7	29.7	28.3	11.8	30
Brooke	Follansbee	54-009-0005	118	12.6	0	27.4	31.9	29.0	13.0	27
Brooke	Weirton	54-009-0011	74	9.3	1	28.5	39.6	28.5	11.6	29
Cabell	Huntington	54-011-0006	115	11.2	0	23.0	26.7	26.7	12.1	25
Hancock	Weirton	54-029-1004	116	11.3	0	28.9	33.2	29.5	11.7	28
Harrison	Clarksburg	54-033-0003	83	9.0	0	20.7	24.7	20.7	10.6	21
Kanawha	Charleston	54-039-0010	108	10.6	0	26.0	30.1	28.2	11.0	24
Kanawha	South Charleston	54-039-1005	119	12.0	0	26.4	32.9	28.3	12.5	26
Marion	Fairmont	54-049-0006	121	11.2	0	28.2	31.7	28.2	12.1	26
Marshall	Moundsville	54-051-1002	117	12.6	0	28.6	31.9	30.8	13.0	29
Monongalia	Morgantown	54-061-0003	121	10.6	0	29.2	31.2	30.7	10.9	25
Ohio	Wheeling	54-069-0010	121	11.3	0	27.5	27.7	27.5	11.9	26
Raleigh	Beckley	54-081-0002	116	9.2	0	20.6	27.4	21.7	9.6	20
Wood	Vienna	54-107-1002	120	11.6	0	25.1	32.1	26.9	12.3	27

$PM_{2.5}$ Speciation Data Summary



PM2.5 Speciation Data Summary - 2011 Monitoring Season: January 1 - December 31 Data Interval: 24-Hour			
County	Site	EPA-ID	# Obs
Kanawha	Guthrie	54-039-0011	94
Kanawha	South Charleston	54-039-1005	59
Marshall	Moundsville	54-051-1002	23
Ohio	Warwood	54-069-0010	38





$PM_{2.5}$ Speciation Data Summary

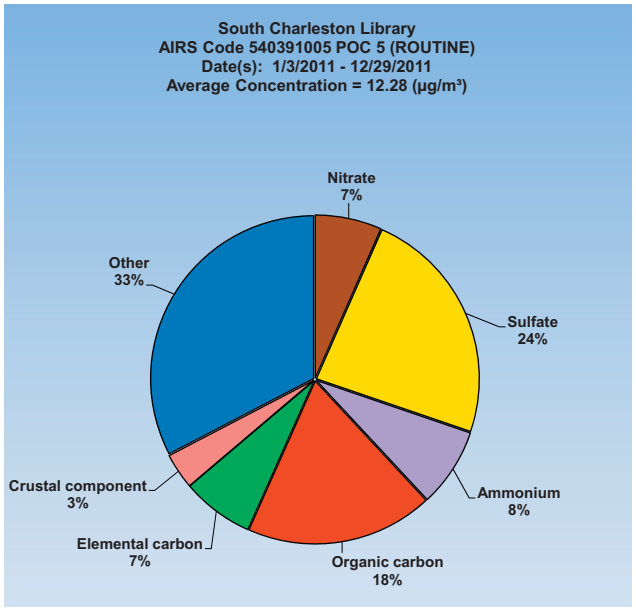
Sulfates and Nitrates: Sulfates are produced by the oxidation of sulfur dioxide (SO_2) gas to water soluble sulfates particles. Nitrates are derived from the atmospheric oxidation of oxides of nitrogen (NO_x). Both SO_2 and NO_x are emitted from the combustion of fossil fuels such as coal fired boilers.

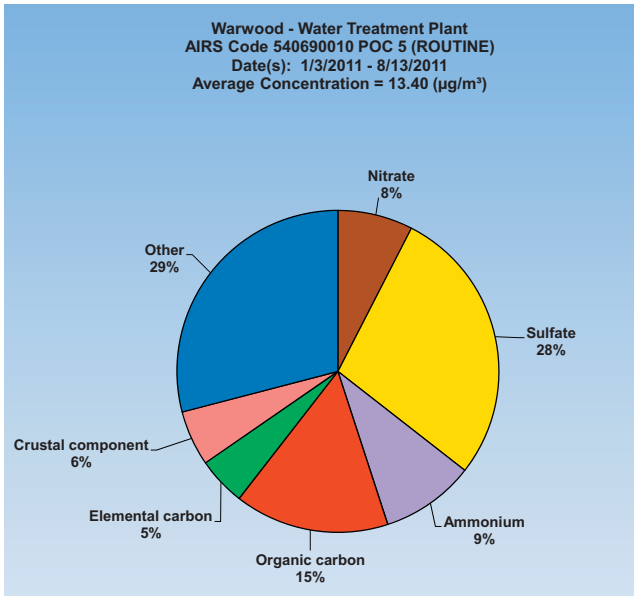
Ammonium: Atmospheric ammonia is a primary basic gas present in the atmosphere. Other significant sources of ammonia are animal waste and ammonia losses from fertilizers.

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.

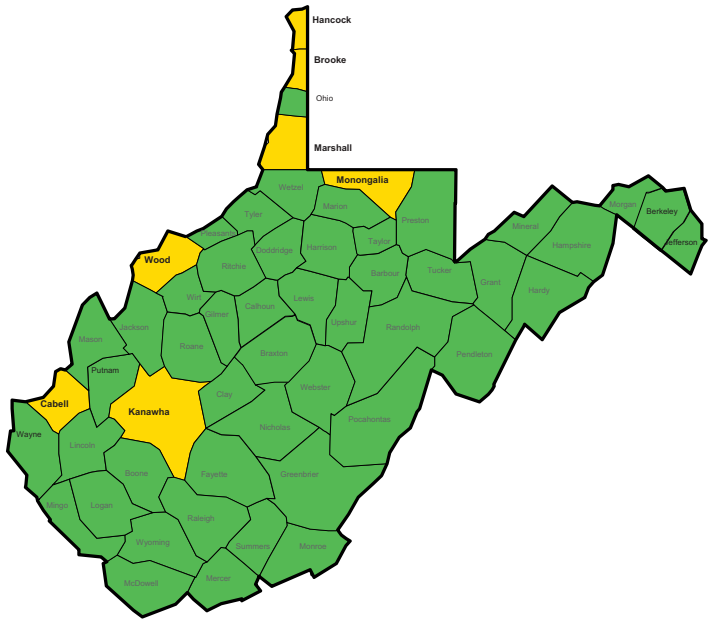




Sulfur Dioxide (SO_2)

Criteria Pollutant Summary Report - 2011

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

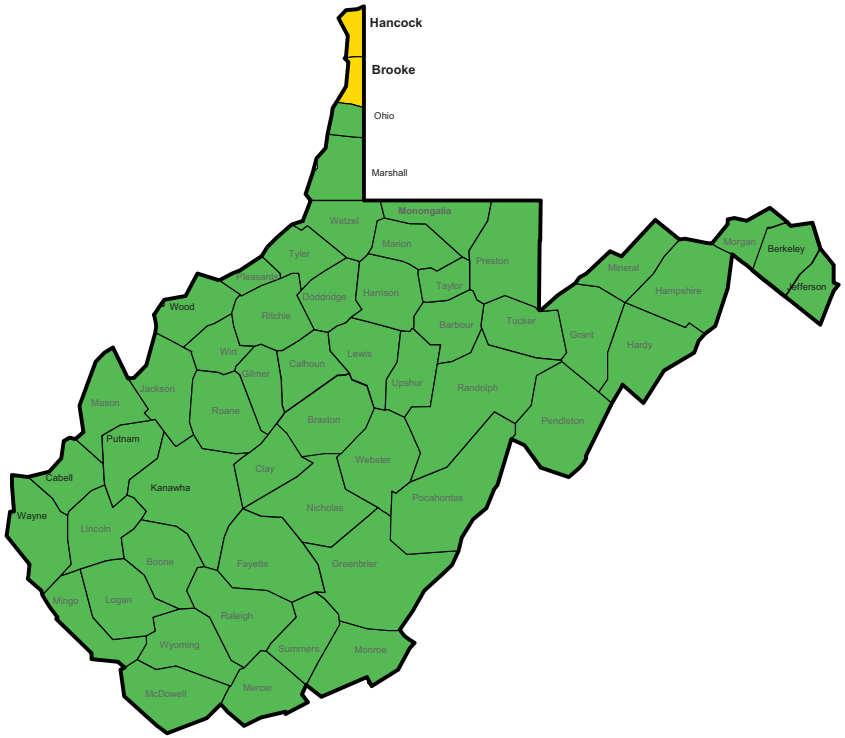


County	Site	EPA-ID	# Obs	Annual Mean	1-Hr Average				3-Hr Average		
					1st Max	2nd Max	99%	09-11 99%	Obs > 500	1st Max	2nd Max
Brooke	Follansbee	54-009-0005	8674	6.58	222	179	143	119	0	164	136
Brooke	Weirton	54-009-0007	8690	6.04	284	105	75	83	0	113	84
Brooke	Weirton	54-009-0011	5694	8.20	342	288	235	174	0	236	198
Cabell	Huntington	54-011-0006	7682	3.37	58	51	42	33	0	58	41
Hancock	New Manchester	54-029-0005	8480	4.46	44	40	33	86	0	28	27
Hancock	New Cumberland	54-029-0007	7801	5.56	45	40	36	66	0	30	30
Hancock	Chester	54-029-0008	8682	3.77	34	31	30	69	0	21	21
Hancock	Weirton	54-029-0009	8621	5.85	166	71	66	88	0	110	56
Hancock	Lawrenceville	54-029-0015	8621	4.12	60	47	34	68	0	32	27
Hancock	Weirton	54-029-1004	8587	6.41	90	65	63	70	0	74	49
Kanawha	Charleston	54-039-0010	8520	4.05	65	61	45	53	0	54	49
Marshall	Moundsville	54-051-1002	8151	6.26	116	80	79	80	0	64	51
Monongalia	Morgantown	54-061-0003	8410	2.65	47	44	22	76	0	29	26
Wood	Vienna	54-107-1002	7638	3.97	98	80	49	84	0	61	56

Carbon Monoxide (CO)

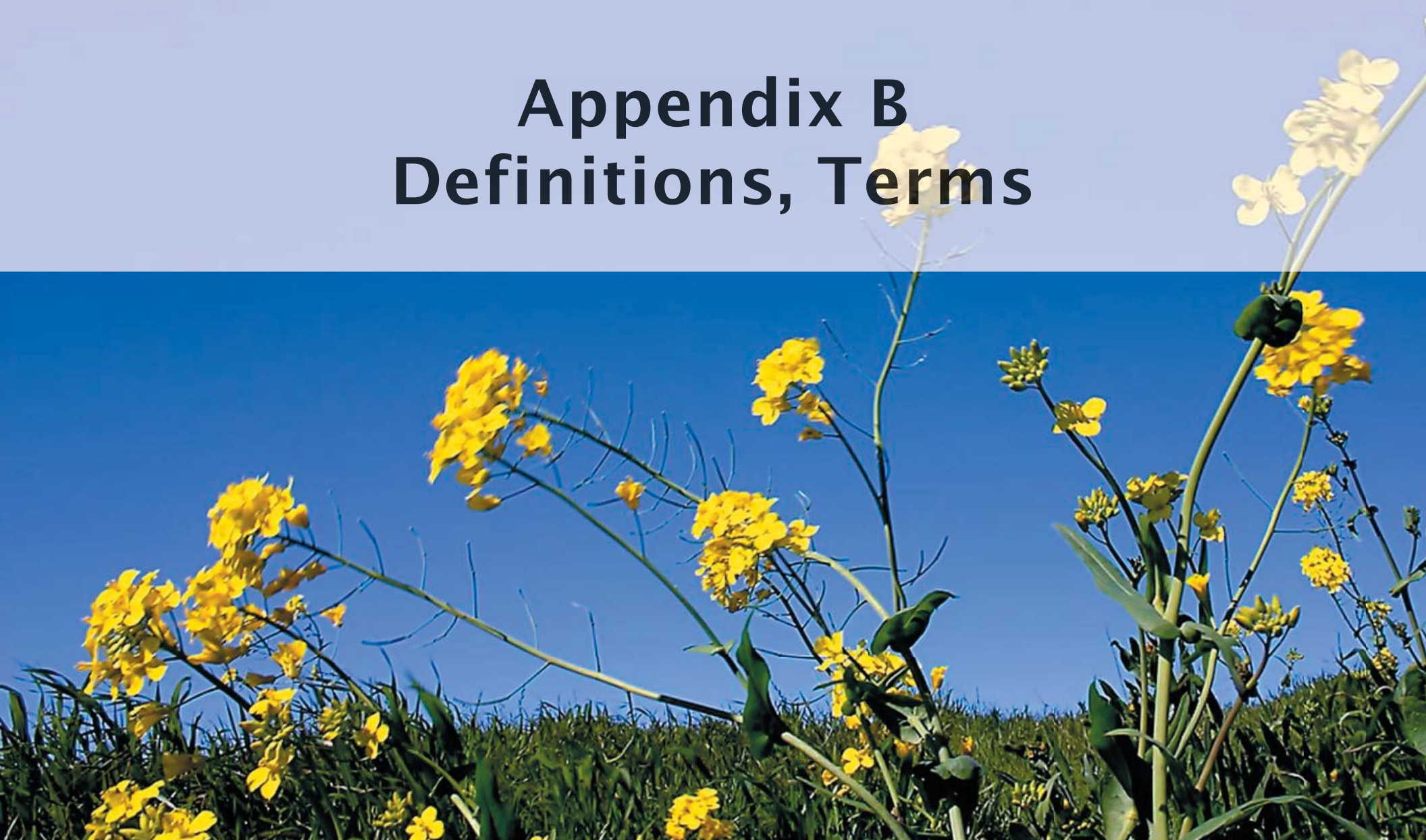
Criteria Pollutant Summary Report - 2011

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	5694	0	1.7	1.1	0	1.1	1.0
Hancock	Weirton	54-029-0009	8690	0	1.3	1.3	0	1.0	.9
Hancock	Weirton	54-029-1004	8701	0	2.5	2.3	0	.9	.9

Appendix B
Definitions, Terms



Definitions

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.

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.

Definitions

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 October 31 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 Quality 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.

Air Quality Internet Sites

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

Environmental Protection Agency
www.epa.gov/

Air Quality Data
Airdata give you access to air quality data collected at outdoor monitors across the United States, Puerto Rico, and the U.S. Virgin Islands.
Emissions data or Air Toxics data is not available at this site.
www.epa.gov/airdata

Emissions Data
www.epa.gov/air/emissions/

Air Toxics Data
http://www.epa.gov/ttn/amtic/toxdat.html

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/

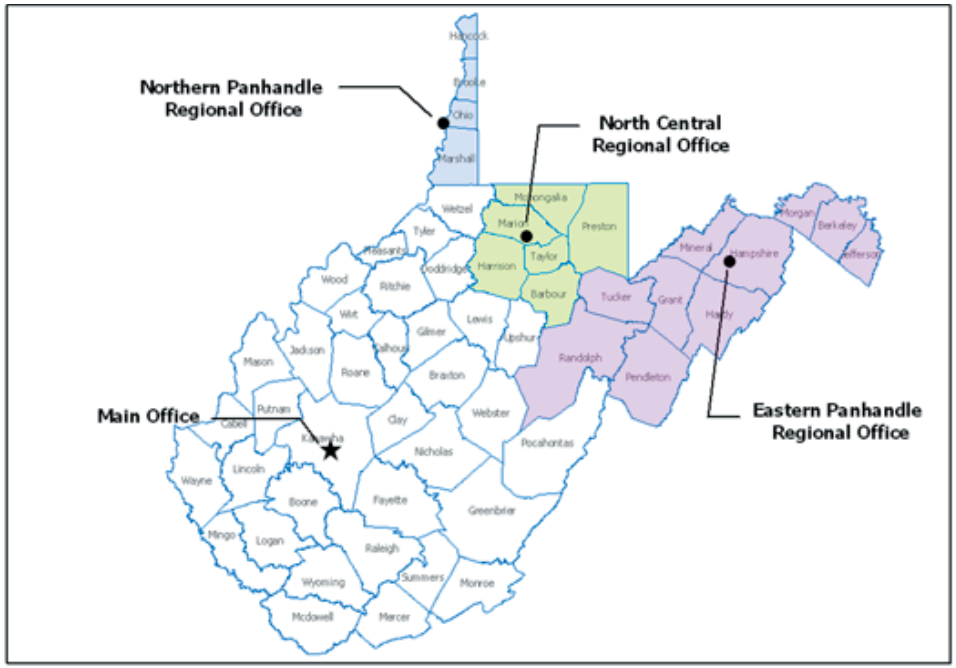
EPA Technology Transfer Network (TTN Web)
Air Quality Monitoring www.epa.gov/ttn/amtic/
NAAQS Information www.epa.gov/ttn/naaqs/

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/

Contact Information

DEP - Division of Air Quality Regional Offices



Charleston Office:
601 57th Street, SE
Charleston, WV 25304
Telephone: (304) 926-0475
Fax: (304) 926-0479

Eastern Panhandle Regional Office:
HC 63, Box 2545
Romney, WV 26757
Telephone: (304) 822-7266
Fax: (304) 822-3535

North Central Regional Office:
2031 Pleasant Valley Road
Suite #1
Fairmont, WV 26554
Telephone: (304) 368-3910
Fax: (304) 368-3959

Northern Panhandle Regional Office:
131A Peninsula Street
Wheeling, WV 26003
Telephone: (304) 238-1220
Fax: (304) 238-1136

Guthrie Lab:
367 Gus R. Douglass Lane
Charleston, WV 25312
Telephone: (304) 558-4323
Fax: (304) 558-1192

Small Business Assistance Program:
Telephone: (866) 568-6649, ext. 1245