Air Quality

2012 Annual Report

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

Each year the compilation of the annual report provides an end-of-the-year opportunity for the Division of Air Quality (DAQ) to review air quality data and events of the previous year. We strive to make the Air Quality Annual Report a useful, comprehensive resource that communicates the quality of West Virginia's air to citizens, industry and other interested organizations.

Air monitoring data collected in 2012 through DAQ's monitoring network continues to depict a decline in air pollution emissions. However, as new research emerges, the U.S. Environmental Protection Agency (EPA) continues its efforts to protect public health by updating the federal health standards. Ambient air quality standards have been strengthened for fine particulate matter, sulfur dioxide, lead and nitrogen dioxide to address human health effects from chronic exposures. The changes were based on more current medical and scientific research. In addition, new emission standards for power plants were finalized to address toxic emissions.

Each year brings improvements to our statewide ambient air monitoring network so we may continue to meet siting criteria and improve site infrastructure. This past year, the monitoring site at Vienna was upgraded with a modern, climate-controlled shelter and a larger sampling platform to accommodate additional sampling equipment. DAQ also upgraded its data-logging capabilities at all the sites and installed state-of-the art data acquisition software.

As the technology to drill natural gas evolves, emerging environmental challenges must be also addressed. In order to gather data to assess the environmental impacts of horizontal gas well drilling operations and respond to legislatively mandated studies, the DEP contracted with West Virginia University to obtain multi-media monitoring as well as a literature review of other similar studies and emission reduction practices. Sampling included air quality monitoring during all stages of well pad development, as well as an evaluation of the structural integrity of pits and impoundments and groundwater associated with centralized pits. Final reports regarding the safety of pits and impoundments used in the drilling of horizontal wells, along with those regarding air monitoring data and air quality impacts were filed with the Legislature in Spring and Summer 2013. Along with supporting information, these three reports have been posted to the WVDEP's Office of Oil and Gas website under the "horizontal drilling" tab in the "legislative studies" section.

DAQ's primary mission is to administer the state's air regulatory program. Additionally, DAQ staff continued their outreach effort to educate the public about how everyday actions and choices impact air quality. This past year, the outreach team participated in events sponsored by various organizations which provided many opportunities to increase awareness regarding the use of alternative energy, energy efficiency, vehicle maintenance and driving tips for reducing emissions, as well as open burning issues.

Managing an air quality program in West Virginia has impacts beyond its borders, and we hope this report will provide an overview of our role in protecting all who breathe the air. Comments and suggestions are always welcome to enhance and improve this publication.

John A. Benedict, Director

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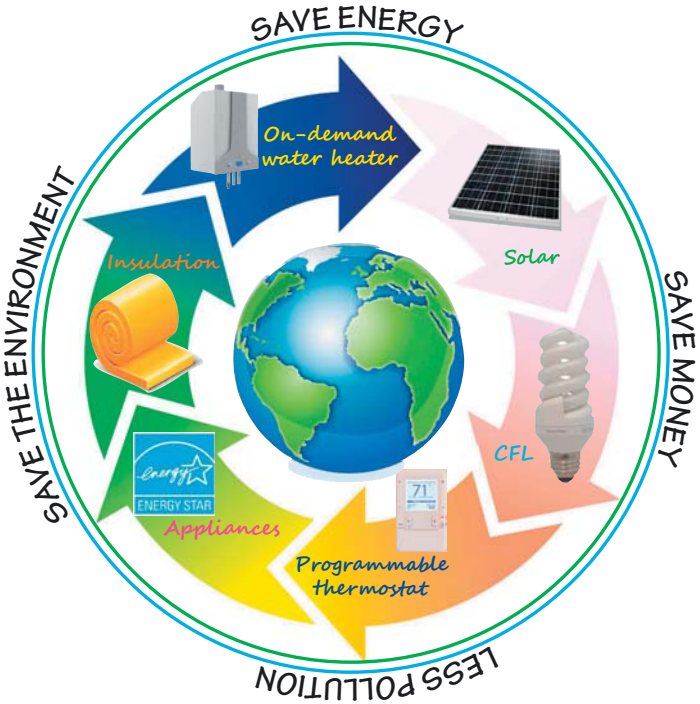


National Ambient Air Quality Standards

Pollutants with Standards

Criteria Pollutants

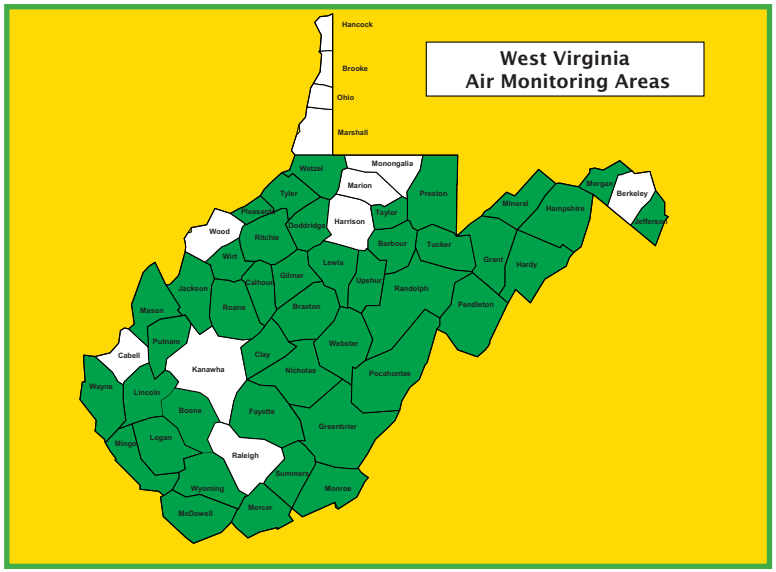
The Clean Air Act (CAA) requires the United States Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for criteria pollutants considered to be harmful to public health and the environment. Criteria pollutants are those pollutants that are common and found all over the United States. The EPA uses these criteria pollutants as indicators of air quality. The agency establishes two distinct kinds of standards for acceptable concentrations of specific pollutants in the ambient (outdoor) air. Primary standards establish 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.

Such standards have been established for six principal pollutants:

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)

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 ($\mu g/m^3$). To help put the terms in perspective, one part per million (ppm) is about one inch compared to 15.8 miles or one second in nearly two years. Some standards may be expressed in parts per billion (ppb). It takes 1,000 ppb to equal 1 ppm. One microgram per cubic meter is approximately equal to one-quarter of the mass of a grain of sand in an olympic-sized swimming pool. 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.

West Virginia maintains a statewide network of monitoring stations as shown on page 34. The network samples and measures (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.



2012 Highlights

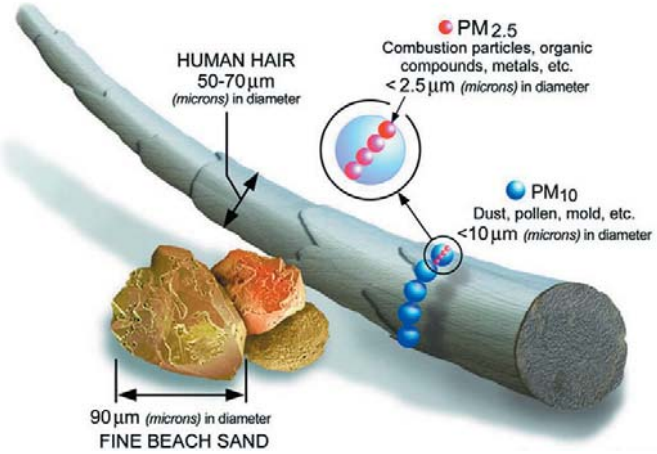
Ozone Standard Highlights

In May 2012, the EPA identified areas in the nation that were violating the most recent ground-level ozone standard. The formal term for this process is designating an area as nonattainment for a specific pollutant, in this case the 2008 ozone standard.

The agency toughened the ozone standard in May 2008 by lowering it to 0.075 parts per million (based on a three year average) and specifying the precision to three decimal places. 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. The EPA has formally designated the entire state of West Virginia as attainment. This means the entire state is considered to be fully in compliance with the 2008 ozone standard. Unlike most of our surrounding states, we have no ozone nonattainment areas.

$PM_{2.5}$ Standard Highlights

As noted in last year's report, West Virginia has six areas that were designated nonattainment for the 1997 fine particulate $PM_{2.5}$ standard. Such particles are a complex mixture of tiny solids and liquid droplets (roughly 1/20th to 1/30th the diameter of a human hair) and penetrate our respiratory defenses to cause health problems. Fine particulates are 2.5 micrometers in diameter and smaller. They can be emitted directly from a variety of sources, including vehicles, smokestacks and fires. They also form when gases emitted by power plants, industrial processes, and gasoline and diesel engines react in the atmosphere.



The areas originally in violation of the standard include:

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

The DEP has requested that the EPA formally redesignate to attainment all the above areas except Martinsburg. That request is still undergoing development. The EPA redesignated the Huntington area to attainment in December 2012 and also proposed approval of the Parkersburg and Wheeling redesignations. Redesignations require corresponding maintenance plans that ensure the areas will stay in attainment for at least 10 years after the plans are approved. The Huntington redesignation was especially challenging because it involved three states, three EPA Regions and multiple transportation planning organizations. It took numerous months of hard work, collaboration and coordination but the EPA finally published approval of the plan in December 2012.

2012 Highlights

$PM_{2.5}$ concentrations have significantly declined in all these areas. Based on the most recent 2010-2012 data, all areas in West Virginia continue monitoring attainment of the 1997 annual $PM_{2.5}$ 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.

In December 2012, the EPA announced revisions to the ambient air quality standards for fine particulate matter ($PM_{2.5}$). The agency decided to increase the protectiveness of the standard by lowering the permissible average annual concentration from 15.0 to 12.0 µg/m^3, averaged over three years. The EPA believes the more stringent standard is required to adequately protect human health.

The agency also retained the existing health standards for the 35 µg/m^3 24-hour standard and the 150 µg/m^3 24-hour coarse particle pollution standard (PM_{10}).

The 24-hour standard is based on the yearly "high" (98th percentile) values, averaged over three years. The annual standard is based upon the three year average of the annual concentration. The DEP has completed its analysis and quality assurance process for the 2012 $PM_{2.5}$ data. The review was very encouraging and it appears that most areas in West Virginia will be in compliance with the new standard. The exceptions are Brooke and Marshall Counties, both of which are currently 1997 $PM_{2.5}$ nonattainment areas as well.

An extensive body of scientific evidence shows that long and short term exposures to fine particle pollution can cause premature death and harmful effects on the cardiovascular system, including increased hospital admissions and emergency room visits for heart attacks and strokes. Scientific evidence also links PM to harmful respiratory effects, including asthma attacks. People most at risk from particle pollution exposure include people with heart or lung disease (including asthma), older adults, children and people of lower socioeconomic status. Research indicates that pregnant women, newborns and people with certain health conditions, such as obesity or diabetes, also may be more susceptible to PM - related effects.

SO_2 Standard Highlights

In June 2010, the EPA finalized revisions to the NAAQS 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.

In a May 2011 letter to the EPA, West Virginia recommended that five counties be designated nonattainment for the 2010 SO_2 standard, based upon certified monitoring data: Brooke, Hancock, Marshall, Monongalia and Wood. Subsequent air monitoring data (2010-2012) indicates that the air quality has significantly improved in all but two counties: Hancock and Marshall. Therefore, West Virginia subsequently recommended that the EPA designate these remaining counties as attainment/unclassifiable for the 2010 1-hour SO_2 standard. The EPA is expected to finalize designations by June 2013. 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.

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 significant agency resources and could identify additional violating areas.

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 rooms and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly and asthmatics.

Outreach and Education

The Division of Air Quality outreach and education team had many opportunities in 2012 to interact with students and the public to share its message regarding ways to reduce our environmental impact. The interactive displays stimulate interest and provide an opportunity to highlight the impact of our individual choices on the environment.

DAQ staff participated in such events as the Department of Environmental Protection Day at the Legislature, Earth Day, Youth Environmental Day, Discover Engineering Day, the Alderson Energy Fair, as well as many other opportunities to showcase the displays and interact with students and the general public.

The solar-powered race track continued to garner lots of attention and highlighted alternative and renewable energy sources. While the kids were busy racing, parents and other interested adults had a chance to check out informative displays that show how saving energy saves money.

Saving energy + saving money = reducing pollution! We continued to focus our attention on educating homeowners on ways to effectively lower their energy bills to save money.

Since heating and cooling accounts for 50% of the energy use in a typical U.S. home and water heating is the second largest expense, DAQ added a tankless water heater and a programmable thermostat exhibit to the array of displays used for energy efficiency education. The thermostat "learns" your schedule, programs itself and can be controlled from a smart phone. As a result, HVAC equipment operates less when you sleep or are away from home. The tankless (on demand-type or instantaneous) water heater provides hot water only when you need it and alleviates the need to store heated water.

Participating in events sponsored by DEP and other organizations has enabled DAQ staff to increase awareness regarding the use of alternative and renewable energy, energy efficiency, vehicle maintenance/driving tips for reducing emissions, as well as open burning issues.

Outreach and Education

Earth Day at the Clay Center

Air Quality Awareness Week

Putnam County Water Festival

DEP Day at the WV Legislature

Youth Environmental Day

Outreach and Education

Asthma Awareness Day

Discovering Engineering Day

Fayette County School Bus Project

Interns Visit Local Power Plant

Bring your Kids to Work Day

Outreach and Education

In addition to the 2012 outreach events, the Division of Air Quality had a great opportunity to educate the public and other employees about air quality issues right at DEP headquarters. Each division in DEP's Kanawha City office was tasked with selecting photographs to be mounted in the hallways that represent a "snapshot" of their efforts to protect and promote a healthy environment. Some of the selected photographs from the air quality division depict completed outreach projects, educational events, and air monitoring sites/laboratory facilities. Other selections provide a visual perspective of historical air quality impacts from manufacturing industries such as steelmaking, quarrying, coal-fired coke plants and kilns, and chemical production.

1981 Charleston
Poor Air Quality

An idea for another project developed as staff reviewed numerous old images. In the entrance hallway, an array of photographs now serves as a reminder of the booming industries which once operated in the area next to the DEP's Kanawha City headquarters. Opened in 1917, the Owens-Illinois Glass Co. became the world's largest producer of glass bottles. Across the street stood the stacks of the Libby-Owens Ford Sheet Glass Co. plant, once the world's largest producer of flat glass and the first company to produce safety glass. At one time, the two industries employed hundreds of West Virginians, but ceased operations when both became technologically outdated in 1963 and 1980, respectively.

The photos on this page, taken from the same Charleston location on Capitol Hill, compare air quality visibility in 1981 and 2011.

2011 Charleston
Good Air Quality

Outreach and Education

Small Business Assistance

A small Marshall County elementary school was the recipient of the Department of Environmental Protection's Clean Energy Award in 2012. The DAQ Small Business Assistance office nominated Hilltop Elementary School for their efforts to incorporate a variety of sustainable design strategies for energy efficiency, lighting, water use and material use. The Marshall County School Board chose to seek Leadership in Energy and Environmental Design (LEED) certification after the school had been designed and the construction awarded to a general contractor.

Hilltop Elementary is a rural school, housing 410 students from pre-kindergarten through fifth grade. As the first LEED-certified school in West Virginia, Hilltop takes its environmental and community responsibilities seriously. It created Sustainable Schools Learning Kits for other area schools through the use of a $54,000 grant from an anonymous donor to move toward its goal of helping all other schools become more sustainable. Learning laboratories for sustainability allow students to learn about environmental footprints, energy efficiency, indoor environmental quality, materials and resources, water efficiency, and innovation and design.

The Small Business Assistance Program 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.

January 2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 New Year's Day	2	3	4	5	6 ☐ Temp Logged ☐ Inspect logged	7
8	9	10	11	12	13 ☐ Temp Logged ☐ Inspect logged	14
15	16 Martin Luther King Jr. Day	17	18	19	20 ☐ Temp Logged ☐ Inspect logged	21
22	23	24	25	26	27 ☐ Temp Logged ☐ Inspect logged	28
29	30	31			Perform monthly PERC leak detection test ☐ (PERC leak tests must be performed with a halogenated hydrocarbon detector)	

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 AIR QUALITY STANDARDS:	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 that 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 (VOC's) 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 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.

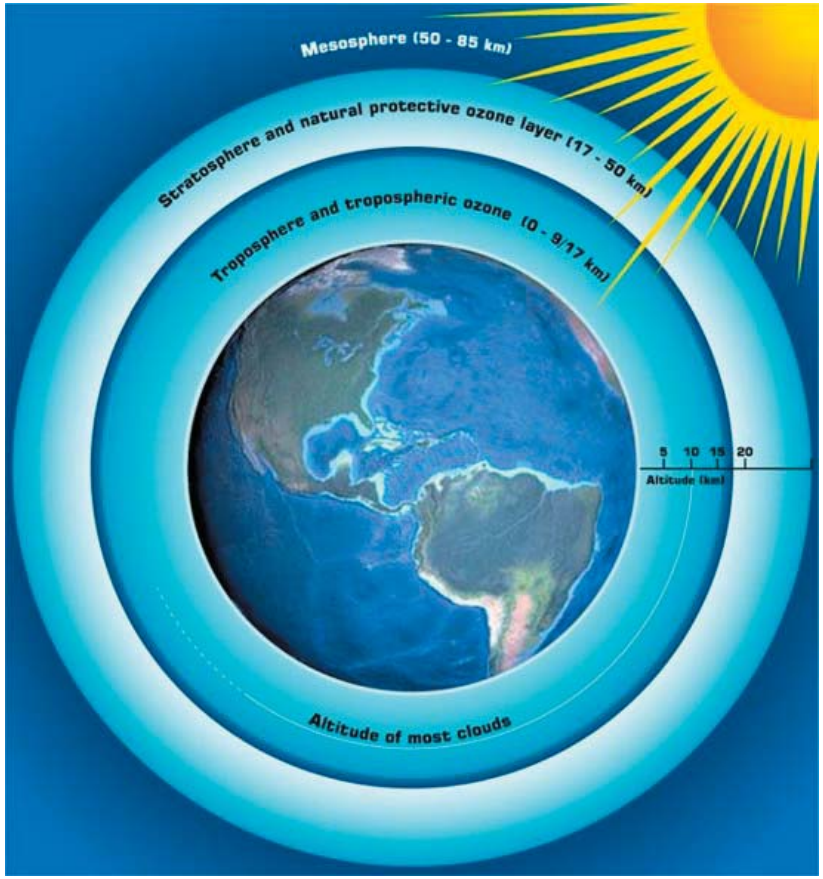
Ozone levels usually begin to rise in the late morning hours and may reach their most unhealthy levels during the evening rush hour. In most areas, ozone levels decrease after sunset. However, if there is little movement of air masses and the heat continues, high ozone levels can continue over several days.

Ozone (0_3)

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 summary of monitored ozone data is shown on page 12.

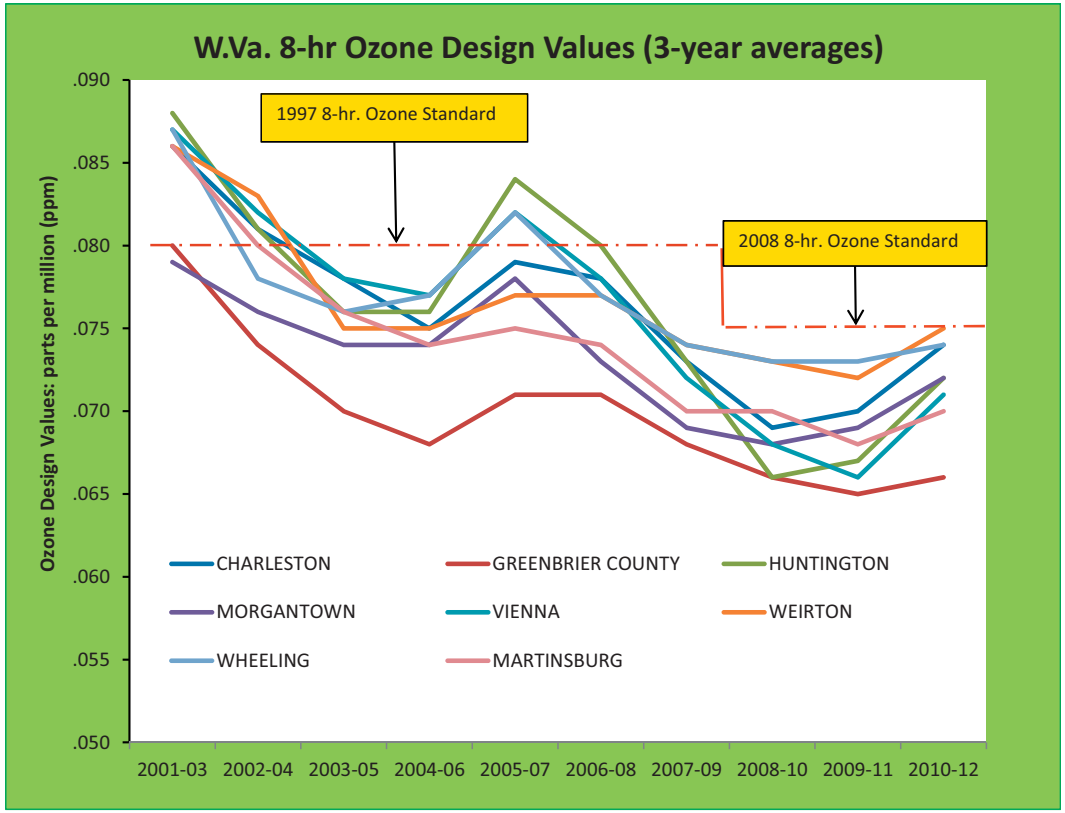
Breathing air containing ozone can reduce lung function and increase respiratory symptoms, thereby aggravating asthma or other respiratory conditions. Ozone exposure also has been associated with increased susceptibility to respiratory infections, medication use by asthmatics, doctor and emergency room 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.



Ozone (0_3)

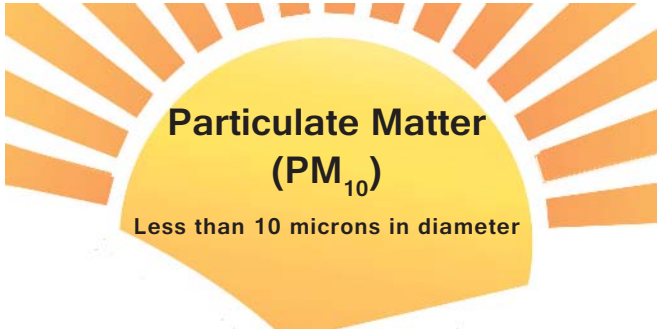
The EPA has identified environmentally protective standards under the Clean Air Act for ozone and instituted a variety of multi-faceted programs to meet these standards. Additional programs are being initiated to cut NO_x and VOC emissions from vehicles, industrial facilities and electric utilities. Programs are also aimed at reducing pollution by reformulating fuels and consumer/commerical products, such as paints and chemical solvents that contain VOC's.

Voluntary programs encourage states and communities to adopt practices, such as carpooling, to reduce harmful emissions.



Some helpful practices when ozone is expected to be high include the following:

- Conserve electricity and set your air conditioner at a higher temperature.
- Choose a cleaner commute - share a ride to work or use public transportation. Bicycle or walk to errands when possible.
- Refuel cars and trucks after dusk.
- Combine errands and reduce trips.
- Limit engine idling.
- Use household, workshop, and garden chemicals in ways that keep evaporation to a minimum, or try to delay using them when poor air quality is forecast.



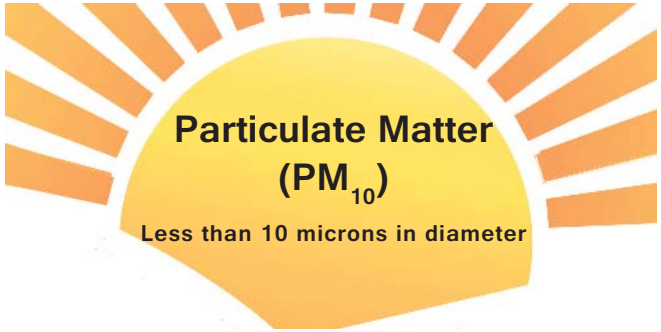
Particulate matter (PM) consists of solid particles and liquid droplets found in the air. These particles and droplets come in a wide range of sizes. Individually, they are invisible to the naked eye. Collectively, however, the particles can appear as clouds or a fog-like haze. Particulates result from 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.

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 microns 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 equal to or less than 10 microns in diameter. The other standard addresses levels of very fine particulate matter (known as $PM_{2.5}$), which contains particles equal to or less than 2.5 microns in diameter. In comparison, a human hair is about 70 microns in diameter. Adverse health effects have been associated with exposures to PM_{10} over short periods (such as a day). 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 established 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.

PRIMARY AIR QUALITY STANDARDS:	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.

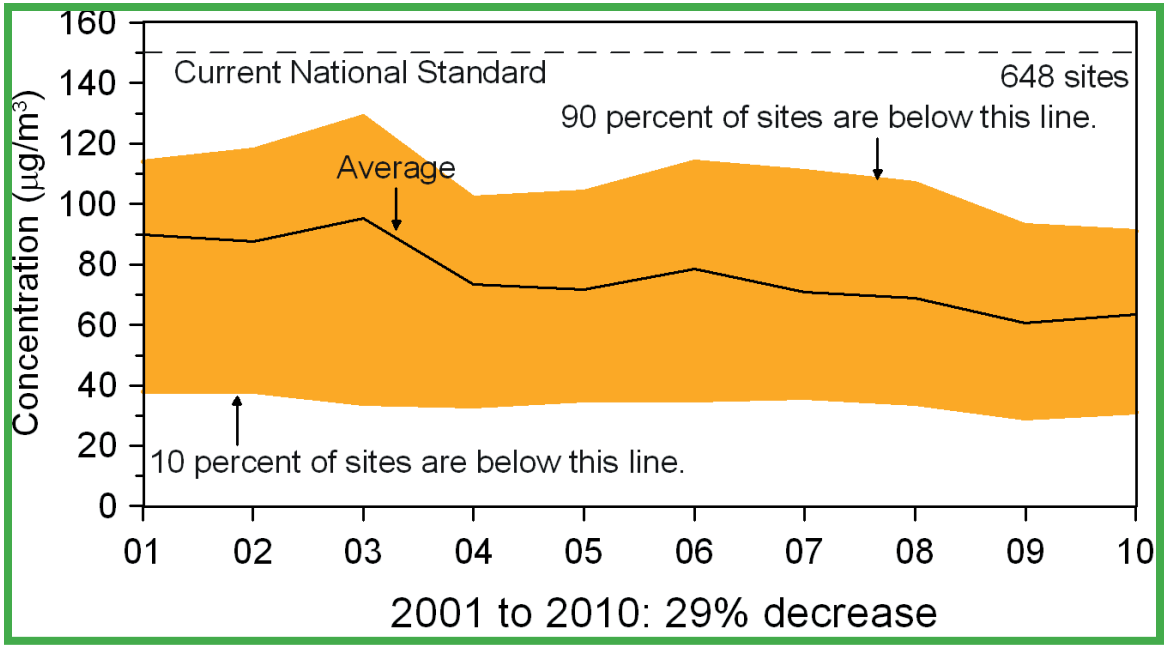
The DAQ's monitoring network measures PM_{10} at five different sites in three counties across West Virginia. Monitors are jointly located at Oak Street in Weirton for quality assurance and quality control purposes. All monitoring sites have shown consistent averaged values that are well below the current 24-hour and the former annual NAAQS.

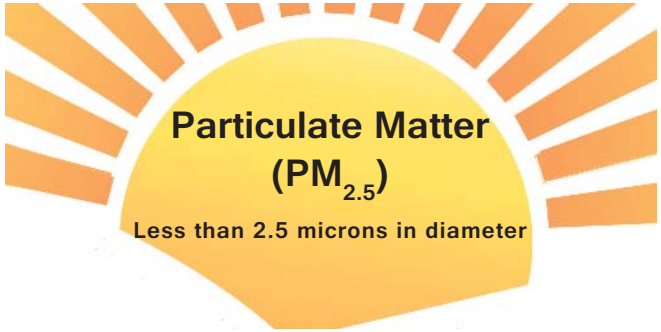


Nationally, PM_{10} concentrations have decreased 31% since 1988. Programs aimed at reducing direct emissions of particles have played an important role in PM_{10} concentrations. Some examples of PM_{10} controls include paving unpaved roads, replacing wood and coal with cleaner-burning fuels like natural gas and using best management practices for dust sources at agricultural facilities.

Additionally, EPA's Acid Rain Program has substantially reduced SO_2 emissions from power plants since 1995 in the eastern United States, contributing to lower particulate matter concentrations. Direct emissions of PM_{10} have decreased approximately 25% nationally since 1988.

National PM_{10} air quality trend, 2001-2010
(second maximum 24-hour concentrations in µg/m³).





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, 2006, and 2012, respectively. Each set has an annual standard and a 24-hour standard. Fourteen $PM_{2.5}$ monitoring sites were operated in West Virginia in 2012. A special filter-weighing laboratory is used to analyze filters from these monitors.

PRIMARY AIR QUALITY STANDARDS:	Annual arithmetic mean not to exceed 12 µg/m³ (based on a 3-year average). 24-hour concentration 35 µg/m³. (3-year average of the 98th percentile)
SECONDARY NAAQS:	Same as primary standard.

Based on the 2002-2004 data, the annual 15 µg/m³ $PM_{2.5}$ non-attainment areas, as published by the EPA in April 2005, for the state are shown in the chart on page 16. The rest of the state was considered to be in attainment for the annual $PM_{2.5}$ standard. The DAQ successfully redesignated the Huntington area to attainment in December 2012. The agency also submitted formal redesignation requests to EPA for the Charleston, Parkersburg, Weirton and Wheeling areas. However, the areas will formally remain designated nonattainment until EPA approves the related maintenance plans that ensure attainment for at least 10 years.

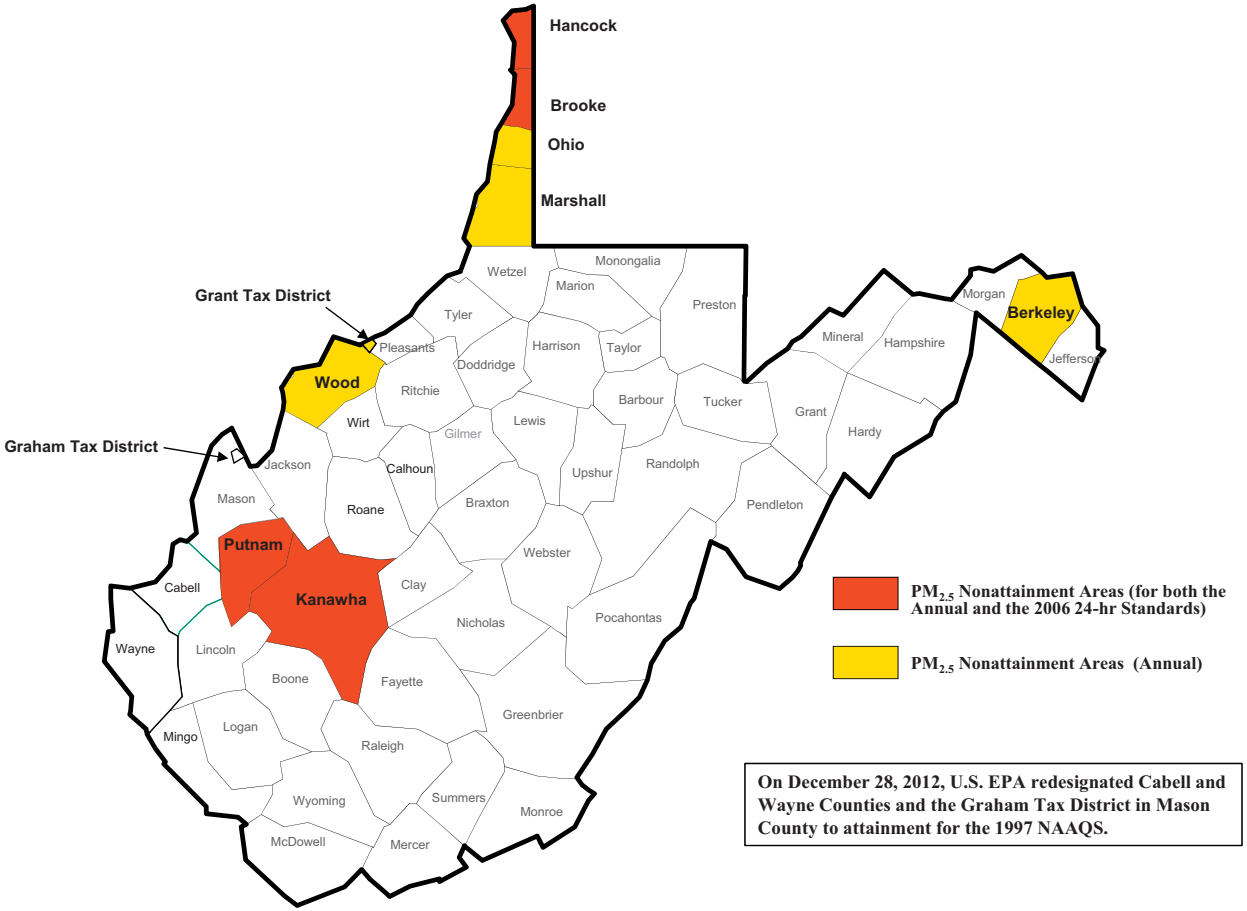
In December 2006, the EPA strengthened the 24-hour fine particle standard from the 1997 level of 65 µg/m³ to 35 µg/m³, and retained the annual fine particle standard at 15 µg/m³. The EPA issued final designations in November 2009. Except for the Charleston and Weirton areas, the entire state was designated attainment/unclassifiable. Both areas later monitored compliance with the 24-hour standard. A historical summary of monitored $PM_{2.5}$ data is located on page 17. Notably, $PM_{2.5}$ concentrations have improved such that during 2010-2012, the entire state continues to attain the 15 µg/m³ annual standard.

EPA most recently revised this standard in December 2012, tightening it to 12 µg/m³. Although the standard is significantly more stringent than the previous one, only two areas in the state, Brooke and Marshall counties, are currently monitoring violations. EPA plans to issue attainment/nonattainment designations in December 2014. Those designations will likely be based on 2010-2013 data, which may show air quality improvement. The charts on page 17 show trends for $PM_{2.5}$ concentrations.

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. 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.

Particulate Matter ($PM_{2.5}$)

Less than 2.5 microns in diameter



On December 28, 2012, U.S. EPA redesignated Cabell and Wayne Counties and the Graham Tax District in Mason County to attainment for the 1997 NAAQS.

DESIGNATED 35 µg/m³ $PM_{2.5}$ (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 15 µg/m³ $PM_{2.5}$ (annual) NONATTAINMENT AREAS **

Berkeley County, W.Va.

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

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

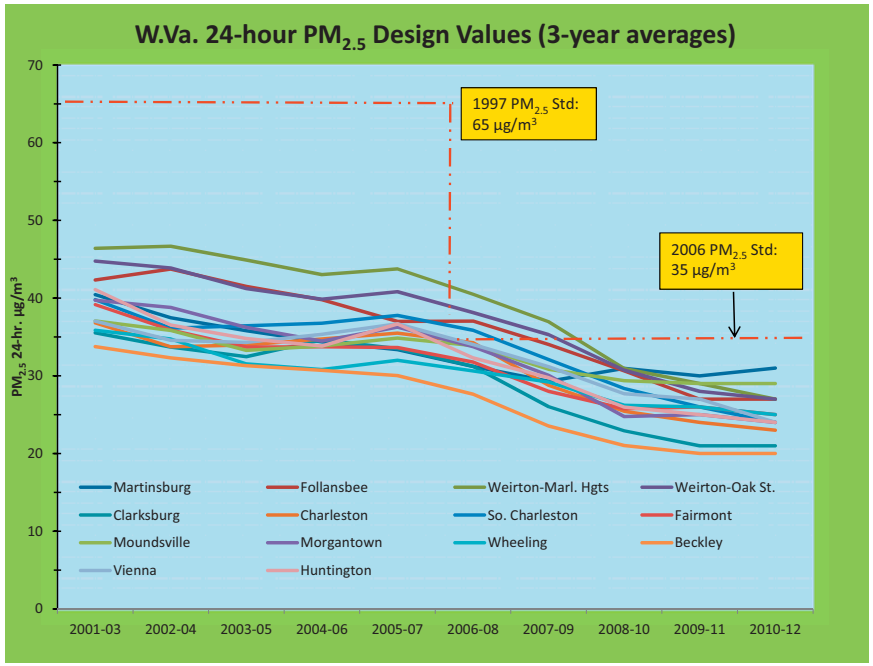
Steubenville, Ohio, Weirton, W.Va. MSA*
- including Brooke and Hancock counties, W.Va.

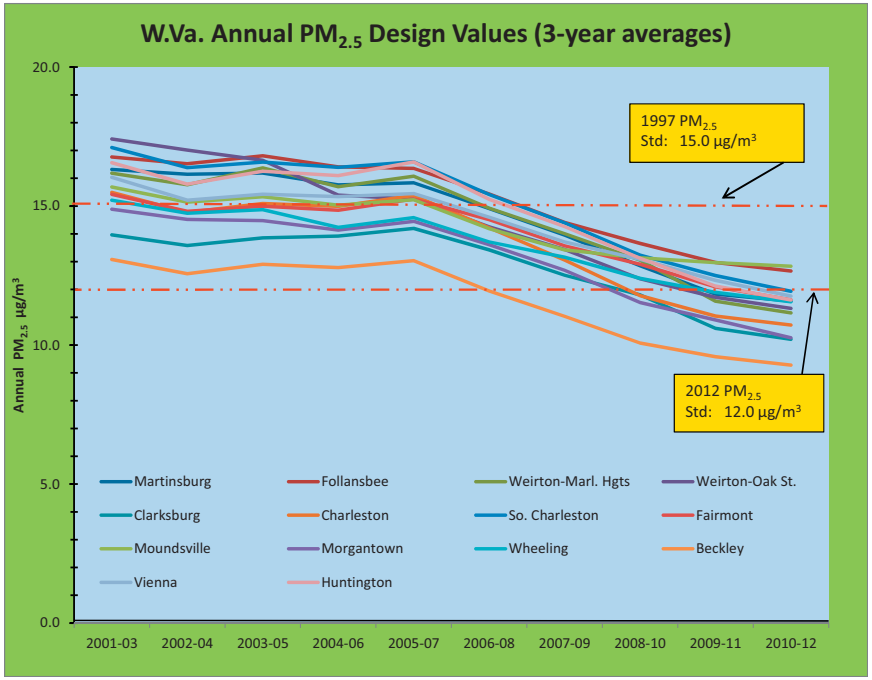
Wheeling, W.Va., Ohio MSA*
- including Ohio and Marshall counties, W.Va. and Belmont County, Ohio

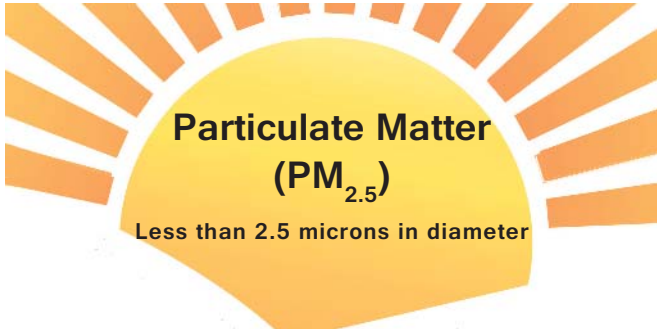
*Metropolitan Statistical Area
**1997 Annual $PM_{2.5}$ Standard

Particulate Matter ($PM_{2.5}$)

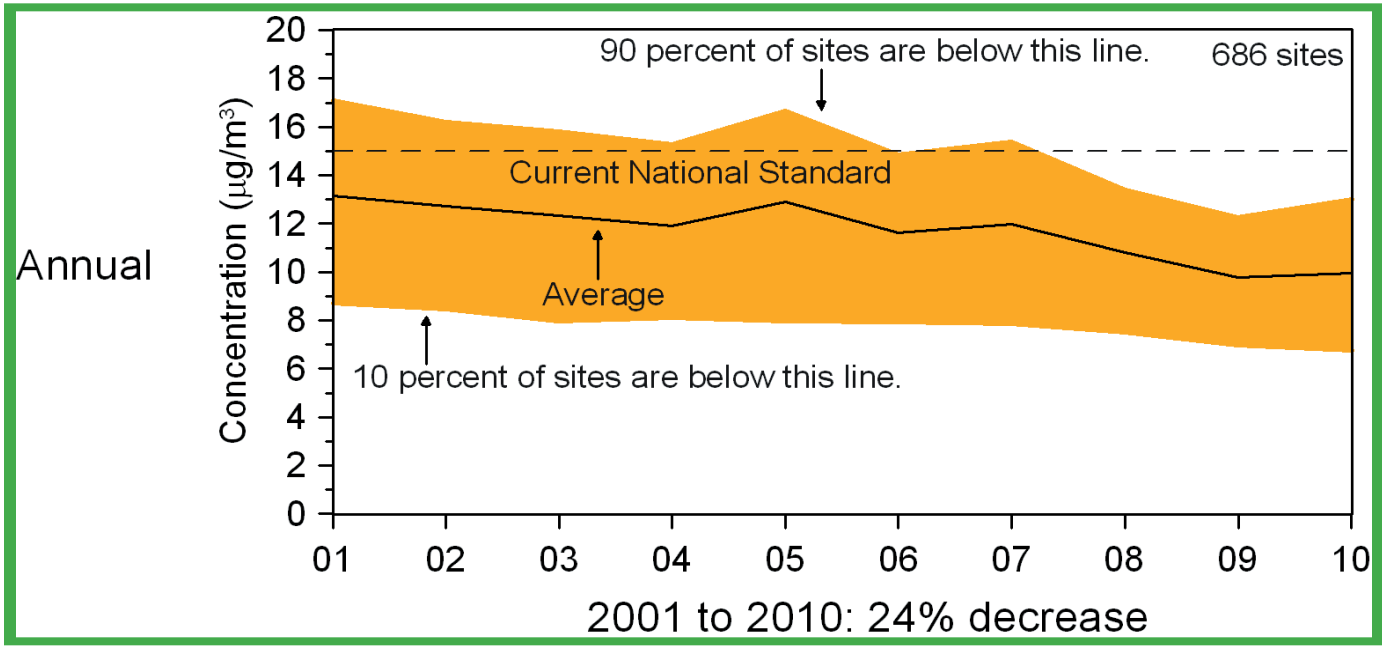
Less than 2.5 microns in diameter

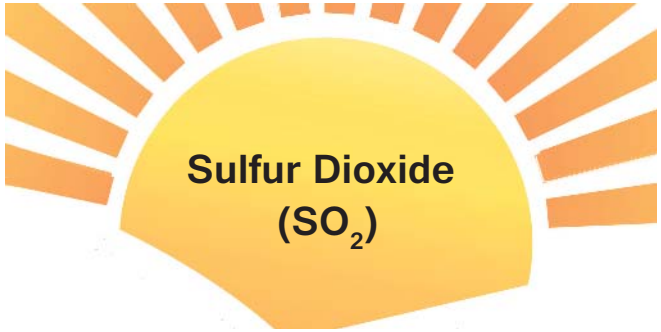






National $PM_{2.5}$ air quality trends, 2001-2010 (annual average concentration in µg/m³). 1997 standard of 15 µg/m³





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 AIR QUALITY STANDARDS: 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 rooms and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly and asthmatics.

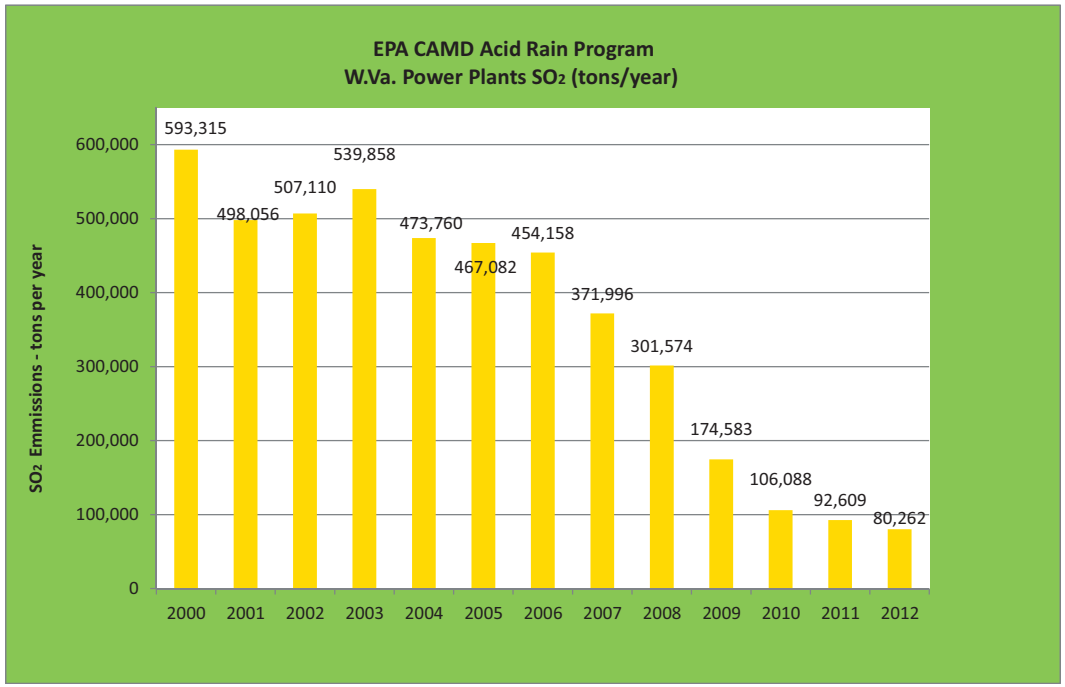
SO_2 can also react with other compounds in the atmosphere to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital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

The chart on page 21 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 current data shows four sites (two counties) remain 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.

Sulfur Dioxide (SO_2)

West Virginia has made significant reductions in sulfur dioxide emissions from power plants. Through implementation of the federal Acid Rain Program and the regional Clean Air Interstate Rule (CAIR), SO_2 emissions have plummeted about 86%, from 593,315 (CY 2000) to 80,262 (CY 2012) tons/year. Several large power plants in the state have invested in very efficient control technologies such as flue-gas desulfurization (FGD). The sharp decrease in emissions after CY 2008 is largely due to application of this technology.

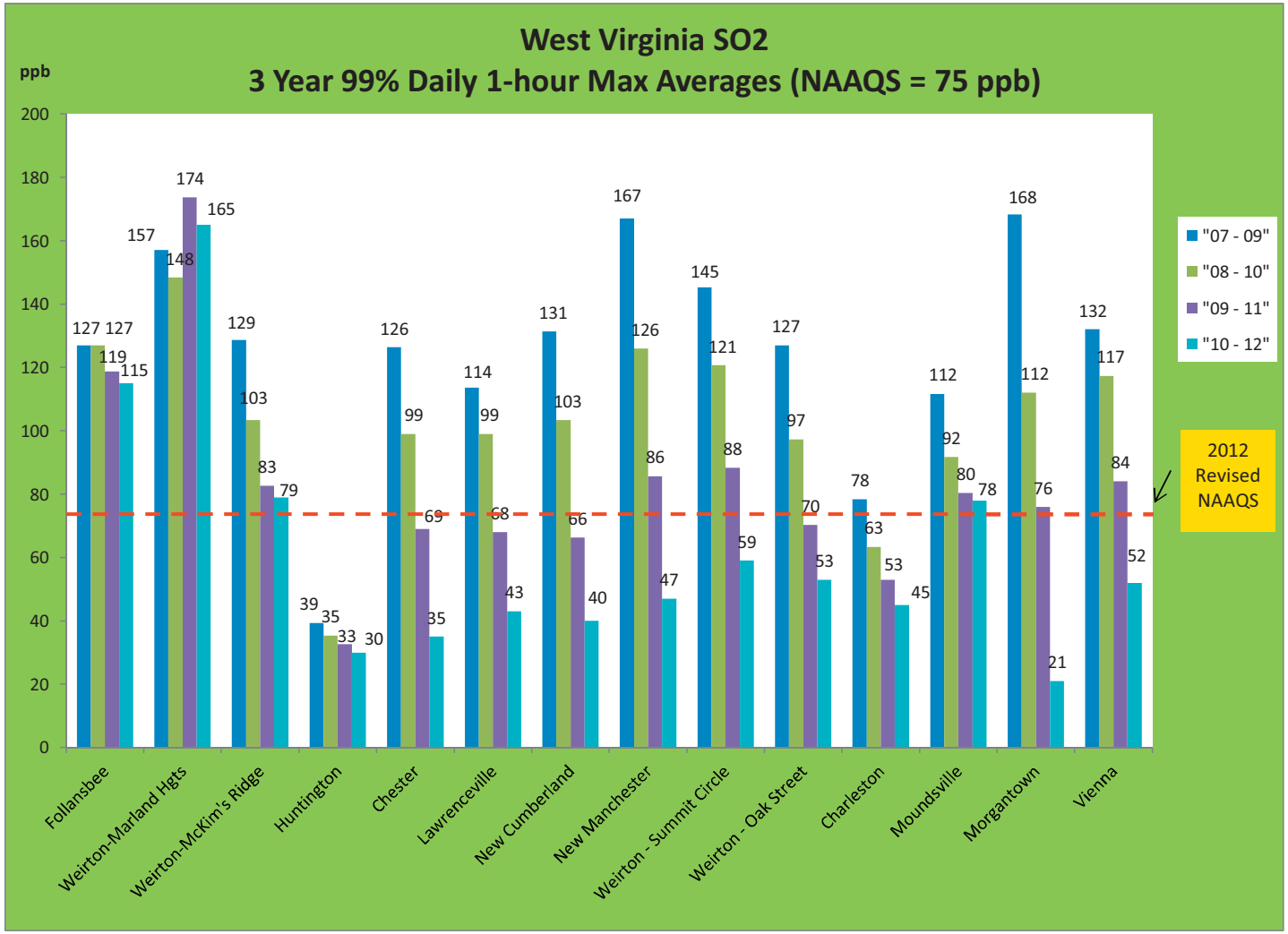


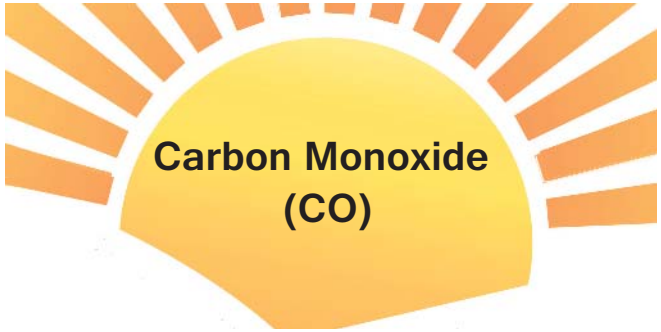
Like many environmental problems, power plant emissions are affected by the cumulative actions of millions of individual people. Therefore, each individual can also reduce their contribution to the problem and become part of the solution. Individuals can contribute directly by conserving energy, since energy production is closely related to SO_2 emissions.

For example, you can:

- Turn off lights, computers, and other appliances when you're not using them.
- Use energy-efficient appliances: lighting, air conditioners, heaters, refrigerators, washing machines, etc. For more information, see EPA's ENERGY STAR Program.
- Only use electric appliances when you need them.
- Keep your thermostat at 68°F in the winter and 72°F in the summer. You can turn it even lower in the winter and higher in the summer when you are away from home.
- Insulate your home as best you can.
- Carpool, use public transportation, or better yet, walk or bicycle whenever possible
- Buy vehicles with low NO_x emissions, and properly maintain your vehicle.

Sulfur Dioxide (SO_2)





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.

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.

PRIMARY AIR QUALITY STANDARDS:	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.

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 2012. In 2012, 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 co-location 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 people are to be operational by January 1, 2015. Those monitors required in CBSAs having 1 million or more people 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 24.

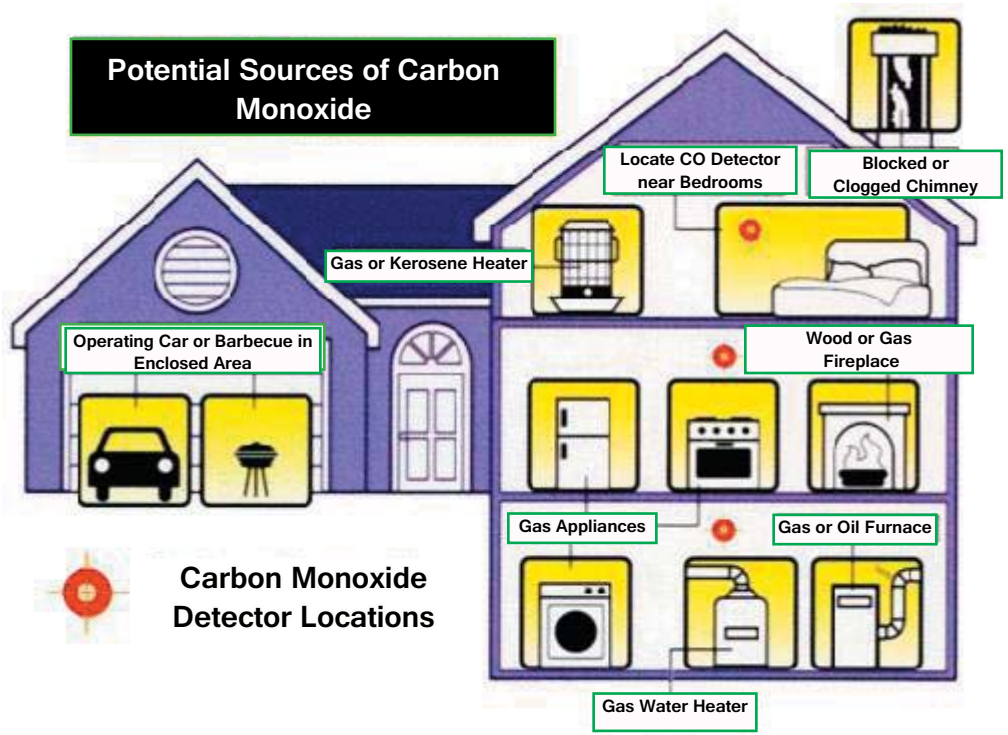
The most effective way to reduce carbon monoxide emissions is to reduce fossil fuel consumption. Many strategies for reducing CO emissions from energy are cross-cutting and apply to homes, businesses, industry, and transportation. Make sure appliances are installed and operated according to the manufacturer's instructions and local building codes. Most appliances should be installed by qualified professionals. Have your heating system professionally inspected and serviced annually to ensure proper operation. The inspector should also check chimneys and flues for blockages, corrosion, partial and complete disconnections, and loose connections.

In addition to CO in the ambient air outside of the home, CO levels from in the home are of concern. Dangerous levels of CO in your home can be caused by improper installation and maintenance of fuel burning applications.

Carbon Monoxide (CO)

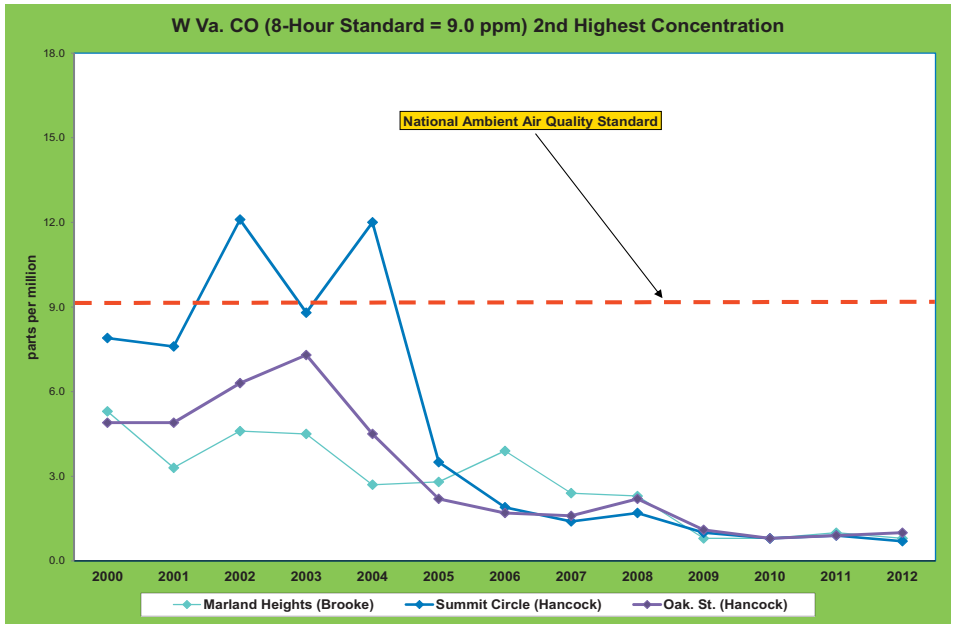
Strategies for reducing CO inside your home include:

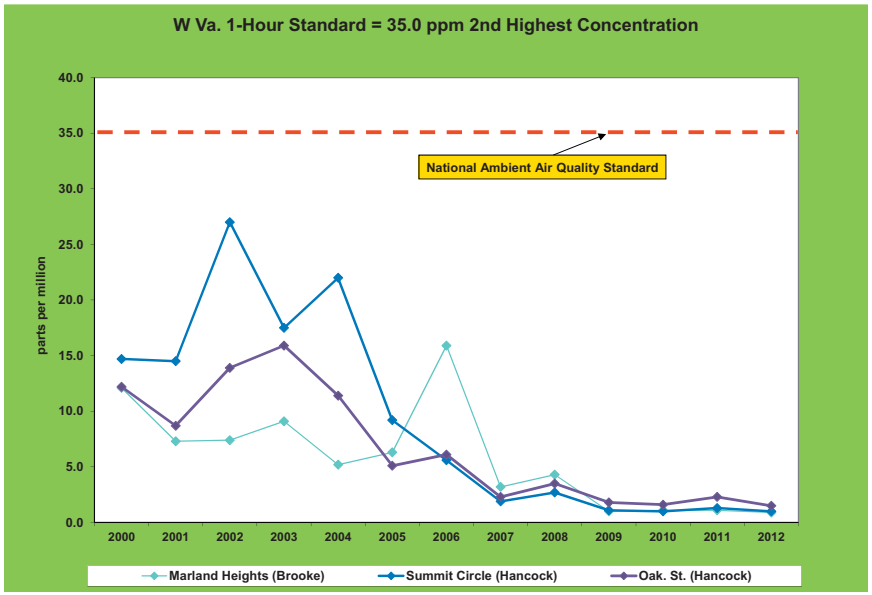
- Never service fuel-burning appliances without proper knowledge, skill and tools. Always refer to the owners manual when performing minor adjustments or servicing fuel-burning equipment.
- Never operate a portable generator or any other gasoline engine-powered tool either in or near an enclosed space such as a garage, house, or other building. Even with open doors and windows, these spaces can trap CO and allow it to quickly build to lethal levels.
- Install a CO alarm that meets the requirements of the current UL 2034 safety standard. A CO alarm can provide some added protection, but it is no substitute for proper use and upkeep of appliances that can produce CO. Install a CO alarm in the hallway near every separate sleeping area of the home. Never use portable fuel-burning camping equipment inside a home, garage, vehicle or tent unless it is specifically designed for use in an enclosed space and provides instructions for safe use in an enclosed area.



- Never burn charcoal inside a home, garage, vehicle, or tent.
- Never leave a car running in an attached garage, even with the garage door open.
- Never use gas appliances such as ranges, ovens, or clothes dryers to heat your home.
- Never operate unvented fuel-burning appliances in any room where people are sleeping.
- Do not cover the bottom of natural gas or propane ovens with aluminum foil. Doing so blocks the combustion air flow through the appliance and can produce CO.
- During home renovations, ensure that appliance vents and chimneys are not blocked by tarps or debris. Make sure appliances are in proper working order when renovations are complete.

Carbon Monoxide (CO)





Prior to 1996, lead in gasoline burned in engines was a significant portion of lead emissions in ambient air. Under the Clean Air Act Amendments of 1990, lead in gasoline was eliminated by January 1, 1996, and replaced with unleaded gasoline. The DAQ lead monitoring network in place at that time began recording much lower lead values as a result of the switch. As monitored lead concentrations in the ambient air dropped significantly and the national emphasis on lead monitoring diminished, these monitors were removed and the resources reallocated to other monitoring initiatives such as $PM_{2.5}$.

Based on new health studies, the EPA tightened the lead standard in 2008, making it 10 times more stringent than the previous standard. The agency revised the primary standard from 1.5 micrograms per cubic meter to 0.15 $\mu g/m^3$. 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 installed a lead monitor at an existing monitoring site in Huntington, WV and began collecting data on February 3, 2012. Although there is less than three years of data, the results for 2012 indicate that the site is well below the lead NAAQS of 0.15$\mu g/m^3$. For the period February 2, 2012 through December 29, 2012, values have ranged from a low of 0.001$\mu g/m^3$ to a high of 0.024$\mu g/m^3$.

The EPA is also requiring monitors to be placed at airports that emit one ton or more of lead. Monitoring is also 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.

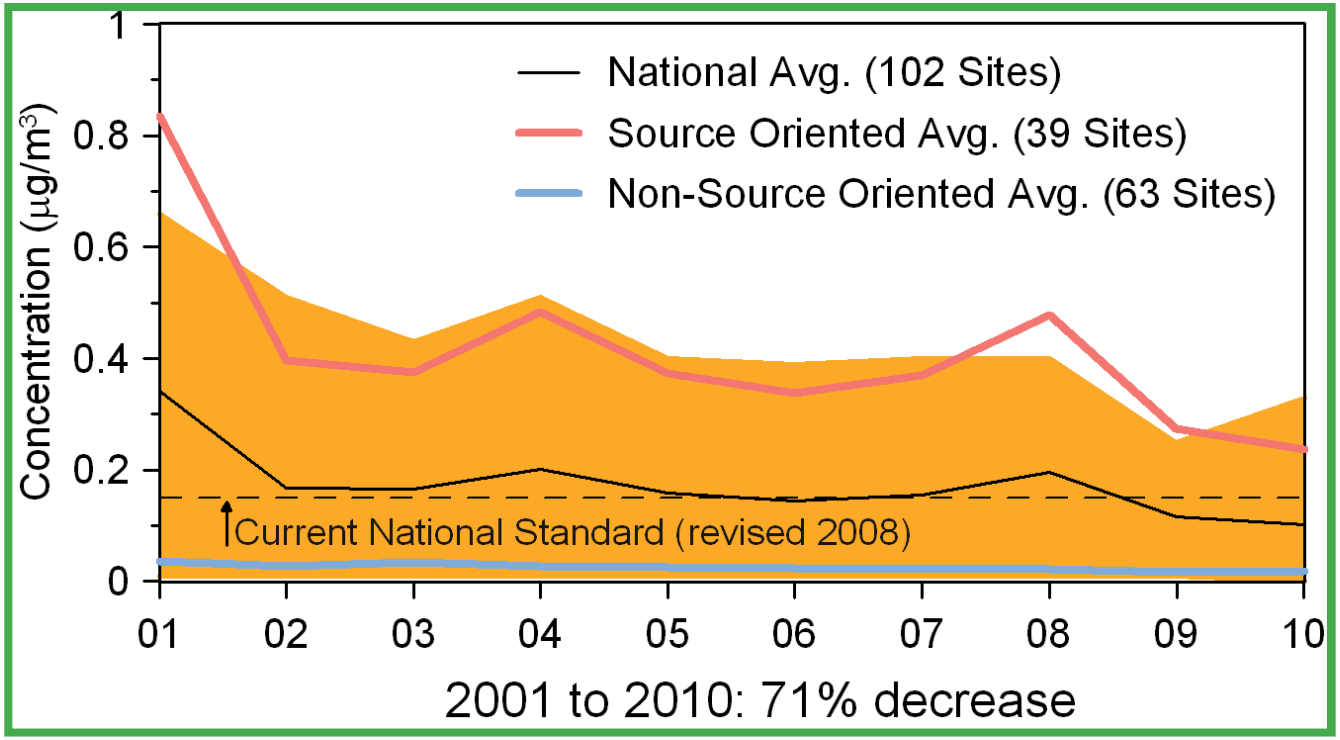
The EPA changed the calculation method for the averaging time to use a "rolling" three-month period with a maximum (not-to-be-exceeded) form, evaluated over a three-year period. This replaces the current approach of using calendar quarters. A rolling three-month average yields 12 three-month periods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

Lead (Pb)

National lead air quality trend, 2001-2010 (maximum 3-month average in µg/m^3).

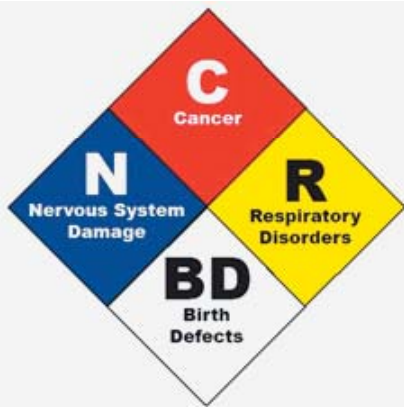


Criteria Pollutants

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 have been an on-going effort. Implementation of these programs has helped reduce emissions of air toxics in West Virginia and the nation. 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, some have only non-cancerous or acute effects, and some may exhibit all of these properties at certain exposure levels. 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 almost 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, wood preservers, small chemical manufacturing facilities, small boilers and newer standards for natural gas facilities with dehydrators. 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 30, HAPs continue to be reduced as the dates for complying with each of these standards for large and small facilities arrive. 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 30, 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 2010 to 2011 is due to reductions of mineral acid emissions at coal-fired electric utilities. The main reasons for the overall reductions in mineral acids in the last year from the electric utilities are installation of air pollution control devices at coal-fired power plants, a reduction in electricity production at some of the facilities, and a change to using site-specific emission factors based on stack testing.

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 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 snapshots 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. 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

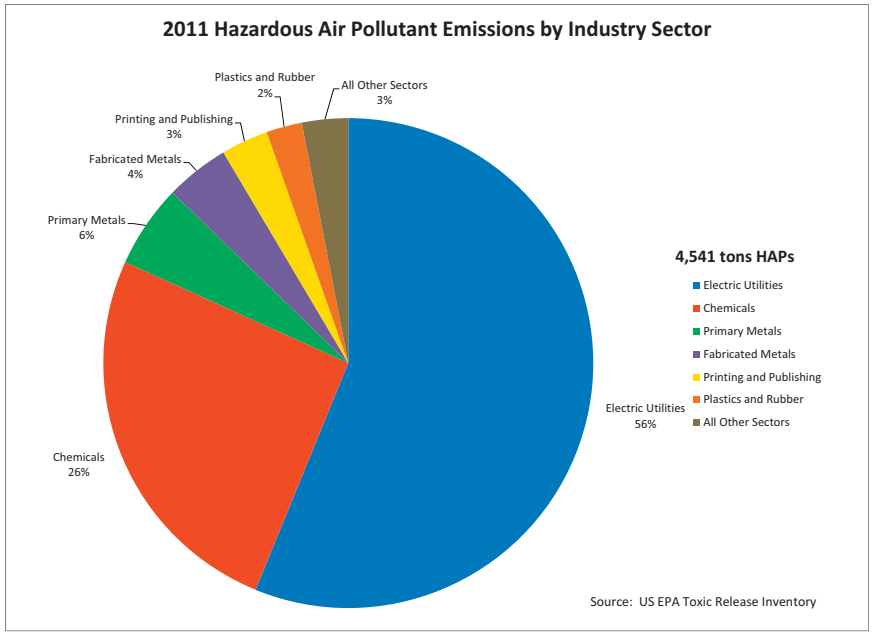
Nationally, the EPA has determined diesel exhaust emissions to be a likely human carcinogen, and is working to reduce diesel exhaust emissions from many types of sources. These emissions are being reduced in West Virginia through partnerships with our sister agencies to help protect our environment at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

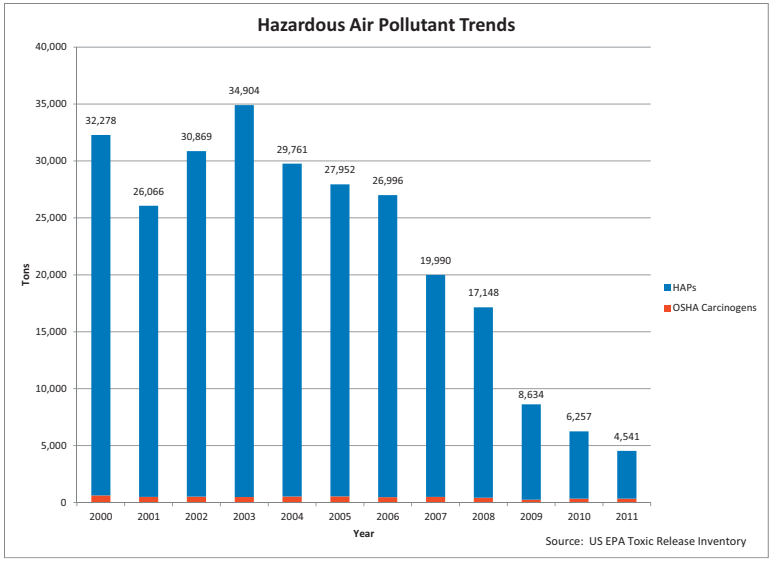
As part of the EPA's National Clean Diesel Campaign, the DAQ has participated in several projects to help reduce diesel emissions in our state. These projects have been accomplished through partnerships with the West Virginia Division of Public Transit and the West Virginia Division of Highways as well 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 air technology in our communities.

In 2010 and 2011, 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 a collaboration with the West Virginia Division of Highways on a pilot project to replace an old heavy duty vehicle with one that meets the newest available EPA emissions standards.

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 Toxics


2011 Hazardous Air Pollutant Emissions by Industry Sector
Plastics and Rubber 2%
All Other Sectors 3%
Printing and Publishing 3%
Fabricated Metals 4%
Primary Metals 6%
Chemicals 26%
Electric Utilities 56%
4,541 tons HAPs
Electric Utilities
Chemicals
Primary Metals
Fabricated Metals
Printing and Publishing
Plastics and Rubber
All Other Sectors
Source: US EPA Toxic Release Inventory


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
4,541
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year
HAPs
OSHA Carcinogens
Source: US EPA Toxic Release Inventory

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 summary table on page 33 includes 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, Huntington, 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, Greenbrier County and Martinsburg are also reported.

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.

Category, Color & Range	What does this mean?	Precautions to take
Good 0-50	Air quality is good.	None: Everyone enjoy outdoor activities.
Moderate 51-100	Air quality is a concern for people who are extra sensitive to air pollution.	People extra sensitive to air pollution: Plan strenuous outdoor activities when air quality is better.
Unhealthy for Sensitive Groups 101-150	Air quality is unhealthy for many people including active adults, people with lung disease (including asthma), older adults and children.	Sensitive groups: Cut back or reschedule strenuous outdoor activities.
Unhealthy 151-200	Air quality is unhealthy for everyone, especially people with heart or lung disease.	Everyone: Avoid strenuous outdoor activities.
Very Unhealthy 201-300	Air quality is unhealthy for everyone, especially people with heart or lung disease.	Everyone: Avoid physical outdoor activities.
Hazardous 301-500	Air quality is hazardous for everyone.	Everyone: Avoid all outdoor activities.

County	2012 - Days in each category:				Pollutants Considered
	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	
Berkeley	190	63	1	0	O_3, $PM_{2.5}$
Brooke	268	85	12	1	SO_2, $PM_{2.5}$, PM_{10}
Cabell	290	65	2	0	O_3, SO_2, $PM_{2.5}$
Greenbrier	193	16	1	0	O_3
Hancock	281	81	4	0	O_3, SO_2, $PM_{2.5}$, PM_{10}
Harrison	85	30	0	0	$PM_{2.5}$
Kanawha	273	91	2	0	O_3, SO_2, $PM_{2.5}$, PM_{10}
Marion	80	42	0	0	$PM_{2.5}$
Marshall	169	197	0	0	SO_2, $PM_{2.5}$
Monongalia	311	54	1	0	O_3, SO_2, $PM_{2.5}$
Ohio	181	82	2	0	O_3, $PM_{2.5}$
Raleigh	102	19	0	0	$PM_{2.5}$
Wood	294	66	4	0	O_3, SO_2, $PM_{2.5}$

West Virginia Division of Air Quality - Monitoring Network

CY 2012

COUNTY	PM_{10}	$PM_{2.5}$	CO	SO_2	O_3	MET	$PM_{2.5}$ 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
Raleigh		1						
Wood		1		1	1			
Total Sites	5	14	3	14	8	1	3	3

Appendix
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.

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.

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). These gases absorb infrared radiation and trap heat in the atmosphere.

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
Varies geographically but for W.Va. it is 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.

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 gives 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
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/ttn/amtic

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

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/**

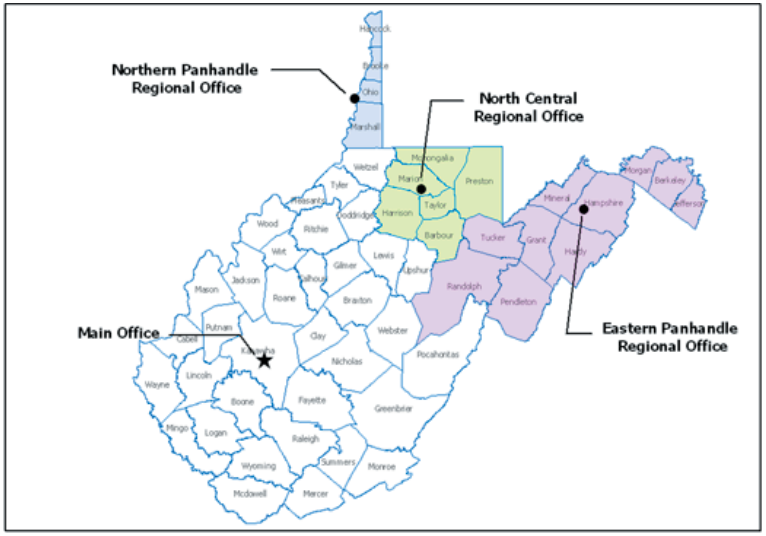
Education
Links for educational resources
www.epa.gov/students/

Provides links to outreach efforts about technical air training, upcoming conferences and environmental education
www.apti-learn.net

Public Notices for Regulatory Actions
www.dep.wv.gov/daq/publicnoticeandcomment/Pages/default.aspx

Contact Information

DEP - Division of Air Quality Regional Offices



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