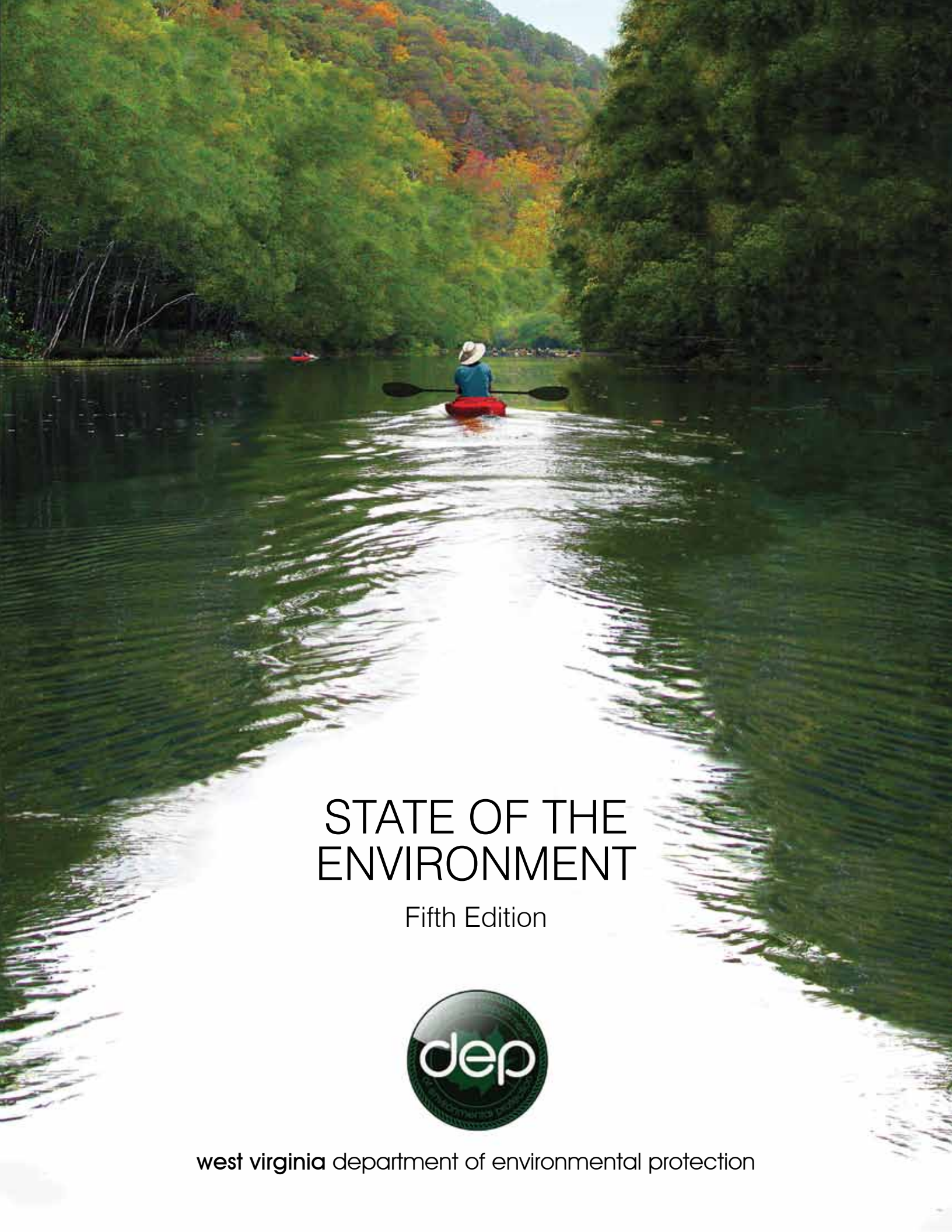


STATE OF THE ENVIRONMENT

Fifth Edition

west virginia department of environmental protection

purpose of this report

This report presents a numerical view of the air we breathe, the quality of our waters, and the land we live on.

The fifth edition of West Virginia's State of the Environment Report is based on a scientific approach to describing elements of environmental quality. To the extent possible, the report presents a numerical view of the air we breathe, the quality of our waters, and the land we live on. It shifts the focus from reporting about activities that are conducted to protect the environment to the results those activities achieve in improving environmental quality. In some instances, environmental impacts of human activity cannot be measured directly. For those cases, indirect measures such as regulatory and non-regulatory program activities may be used.

The report does not draw conclusions about the quality of West Virginia's environment. It simply presents a common base of data and trends, where possible, for others to interpret and analyze. Furthermore, this report continues what will be a long-term process to identify and track changes in the environment resulting from human activities. It also provides a basis for evaluating the success of regulatory and non-regulatory programs designed to improve environmental quality.

In this report, information about environmental quality is presented through the use of environmental indicators. These are measures of physical, chemical, biological, or socioeconomic factors that represent the key elements of complex ecosystems or environmental issues.

In the same way economic and social indicators are used to evaluate the health of our economy and the welfare of our citizens, environmental indicators can provide an objective, scientific-based representation of the state of the environment.

They can be used to communicate information to the public about the condition of the environment statewide and locally where they live and work. They also can help improve understanding of how different components of the environment interact and how environmental quality is affected by human activity.

The indicators used to describe the status and trends of the state's air, water and land resources were chosen based on data that was readily available within the DEP and other state and federal agencies.

Framework for indicators

Environmental indicators are scientifically-based measures of air, water and land quality. They measure pressures caused by human activities, as well as natural phenomena, on ecosystems and public health.

Indicators are powerful tools in a results-based environmental management system. They focus on outcomes of environmental protection programs, such as cleaner air or water, rather than on administrative actions, such as the number of permits issued.

Most environmental indicator systems are based on a "pressure-state-effects-response" model. This report follows a variation of the model originally developed by the International Organization for Economic Cooperation and Development (OECD). The OECD model has been adapted, modified and used by several states and by the U.S. Environmental Protection Agency to report environmental initiatives. It offers a useful perspective on how indicators may be developed and used. The version used in this report is borrowed from Environmental Protection Indicators for California, published jointly by the California Environmental Protection Agency and California Resources Agency in April 2002.

Read more about 5 aspects of the "pressure-state-effects-response" model on page iv.

Environmental indicators measure pressures caused by human activities, as well as natural phenomena, on ecosystems and public health.

WEST VIRGINIA STATE OF THE ENVIRONMENT REPORT

Fifth Edition

2014

Prepared by the

west virginia department of environmental protection

Greetings from the DEP Cabinet Secretary

As we issue the fifth edition of our State of the Environment Report, it's safe to say challenging times are ahead for the West Virginia Department of Environmental Protection. On the horizon are proposed new air emission standards for existing coal-fired power plants across the country. The methodology for achieving the U.S. Environmental Protection Agency's proposed reductions in carbon dioxide emissions is unprecedented and undoubtedly would be difficult to navigate for environmental regulators.

Other challenges await us as well. While natural gas production in West Virginia continues to grow, our agency's focus will remain on making sure drillers are protective of the state's land, air and water. We'll also keep a watchful eye on new industry and manufacturing that shale gas development will bring to the Mountain State. With its abundance of natural gas, West Virginia will continue to be an attractive hub for the petrochemical industry. The DEP must be diligent in ensuring new businesses operate within the guidelines of environmental laws and regulations.

In January 2014, we learned how precious clean water is and how chaotic life can become without it. The Elk River chemical spill in Charleston contaminated the drinking water for 300,000 people in a nine-county region and served as a wake-up call for citizens, industry and government regulators. Gov. Tomblin rightfully called for new legislation to better regulate aboveground storage tanks. Its foundation is a registration/inspection requirement for aboveground tanks and our agency is committed to holding tank owners accountable under the law.

The DEP, in 2014, also proposed to re-categorize a 70-plus mile stretch of the Kanawha River to allow that section to possibly be used as a drinking water source. Returning this portion of the river to drinking water-use status has the potential to spark economic growth in cities and towns along the waterway and help conditions in the river continue to improve.

While challenges remain down the road, the DEP has accomplished much in the three years since the agency last issued this report. A comprehensive bill to improve regulations in the oil and gas industry was passed; the agency's Clean Water State Revolving Fund eclipsed the $1 billion mark in low-interest loans for wastewater treatment projects; and various DEP offices, working alongside citizens, helped bring back to life a large section of the Little Coal River in Boone County, where pre-law mining and other past industrial activities had degraded the waterway.

These are just a few examples of what our agency can achieve when we work together with state and federal partners, business leaders, elected government officials and citizens. Only through these combined efforts can the DEP best carry out its mission of promoting a healthy environment. I hope this report proves useful to you, and please don't hesitate to offer any comments to my office. Thank you for all your efforts in making West Virginia a great state in which to live, work and play.

Randy C. Huffman
Cabinet Secretary

Greetings from the Governor of West Virginia

We are blessed to welcome visitors from across the country and around the globe to experience and explore West Virginia's natural beauty. Whether just outside your window or miles away, we must make every effort to ensure West Virginia's rolling hills and miles of streams and rivers are protected now and for years to come.

This fifth edition of the State of the Environment Report highlights the West Virginia Department of Environmental Protection's continued efforts to improve and safeguard our state's environment. Over the past year, the DEP has implemented a number of statewide initiatives and several noteworthy projects are underway, including air and water quality improvements, expansion of modern wastewater treatment systems, remediation of brownfields to productive uses, and volunteer programs to keep our state's streams, roadways and parks clean.

As a state with abundant natural resources, there's always more work to be done. We understand the importance of environmental stewardship and are committed to preserving our state's beauty for generations to enjoy. As new industry arrives in the Mountain State, we must continue to balance the environmental protection we all support with the economic growth we must maintain.

By continuing the conversation through collaborative efforts, I'm confident we can create a bright future for the Mountain State now and for generations to come.

Sincerely,

Earl Ray Tomblin
Governor

Five aspects of a "Pressure-state-effects-response" model

Most environmental indicator systems are based on a "pressure-state-effects-response" model. This report follows a model developed by the International Organization for Economic Cooperation and Development (OECD)

The "Pressure-state-effects-response" model presents a view of environmental quality from five aspects:

- The driving forces which are the human activities or aspects that exert pressures on the environment, that are the underlying cause or causes of a problem. Examples of driving forces include population growth, economic expansion, and energy use.
- The pressures on the environment resulting from the driving forces. These are physical, biological and chemical stresses on the environment such as pollution emissions and discharges, waste generation, and land use patterns.
- The state variable which describes some physical measurable characteristic of the environment that results from the pressure. Examples include indicators that monitor aspects of water and air quality, waste generation, and existence and quality of habitats.
- The effects variable which evaluates the impact of the stresses on the environment on human health and ecosystem health.
- The response variable which measures to what degree society is responding to environmental changes and concerns. This includes policies, regulatory actions, or investments that are made to address an issue.

Indicators can be developed for each of the five aspects of this model. Typically, state environment reports have focused on indicators of pressure, state, and response.

For this report, the recommended environmental indicators include pressure and state indicators only. Response indicators will continue to be reported separately in DEP's annual activity report.

As helpful as they are in planning and decision-making, indicators must be viewed with caution because they vary widely in their ability to provide useful information.

At best, indicators provide direct measures of environmental, human and ecological health. However, definitive measures are available in only a relatively few areas. Caution must be used in any attempts to establish a cause and effect relationship between an activity and a change in the environment.

Many factors can influence a single change in the environment, and care must be taken to investigate all possible influences before attributing the change to a particular program activity, for example.

How the indicators were developed

This report was developed in conjunction with the National Institute for Chemical Studies (NICS). NICS is a nonprofit research and education organization and has collaborated with the DEP on numerous projects.

Ten criteria guided the selection of the environmental indicators:

1. The indicator should be results-based, to the extent possible; that is, it should provide a measure of actual changes in environmental conditions.
2. The indicator should have a relatively high level of significance to the health of West Virginia citizens and/or its ecosystems.
3. It should be based on scientifically accepted data collection methods.
4. It should be able to distinguish meaningful differences in environmental conditions with an acceptable degree of resolution.
5. The indicator should provide information useful for making policy decisions.
6. The indicator should provide an early warning of changes in the environment or part thereof.
7. The indicator should be useful for making comparisons to indicators in other states, regions or nations.
8. Data collection that produces the type and amount of information needed to support an indicator should be carried out at a reasonable cost.
9. The indicator should be stated in a manner that allows comparison to a benchmark value or point of reference so that users can assess its significance.
10. The indicator should relate to the DEP mission and available data should be used to support the indicator.

West Virginia State of the Environment Report

Fifth Edition

Chapters

Exposure to air pollution is associated with numerous adverse effects on human health.

West Virginians enjoy some of the best air quality in the Mid-Atlantic Section of the United States. Continuous efforts to further improve air quality are in place. Nevertheless, exposure to air pollution is associated with numerous effects on human health. These include respiratory problems, heart and lung disease, and even premature death. Children are at greater risk because they are generally more active outdoors and their lungs are still developing.

Elderly people and people with heart or lung diseases are more sensitive to some types of air pollution. Air pollutants can also significantly affect ecosystems. According to the United States Environmental Protection Agency (EPA), groundlevel ozone has been associated with reduced agricultural and commercial forest yields. Airborne releases of nitrogen oxide have contributed to nitrogen pollution, which can decrease a water supply's ability to support habitat. And deposition of mercury compounds resulting in statewide fish consumption advisories is a contributing factor to impaired water quality.

Unlike a watershed where rivers, streams and runoff flow into a specific body of water, air has few natural or manmade boundaries that constrain its flow. Air movement is affected by complex relationships between the sun, oceans, the jet stream and high and low pressure systems, as well as its interface with topography.

The synergy between these systems moves air across large regions of the Earth. The states located east of the Mississippi River may be thought of as a regional area that shares air patterns and movement. Contributors to the eastern states' regional air quality are large stationary sources (factories and power plants); smaller sources (dry cleaners and degreasing operations); mobile sources (automobiles, airplanes, and trains); and natural sources (windblown dust and forest fires).

Criteria Air Pollutants

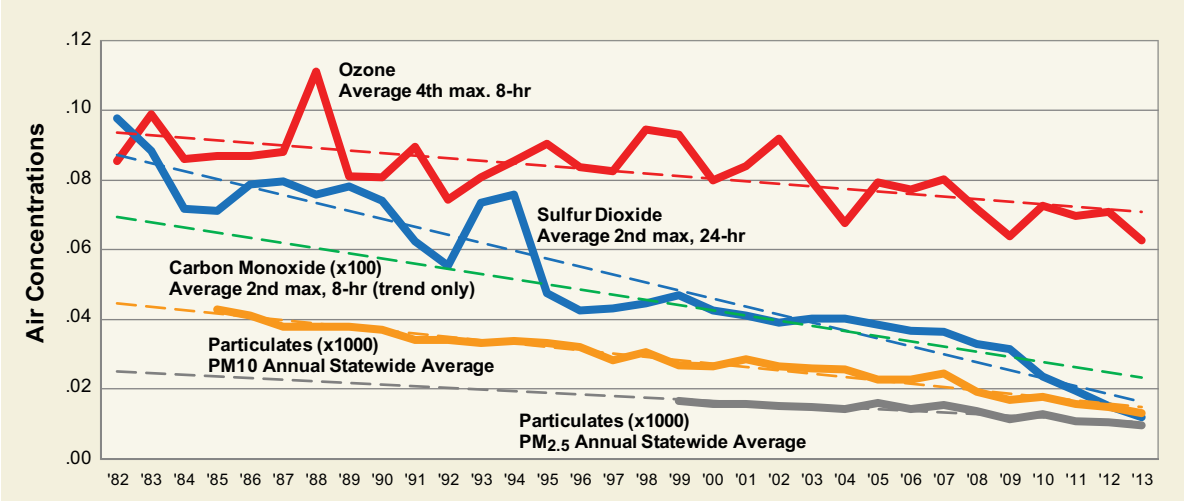
Under the federal Clean Air Act, standards were set by the EPA for six common criteria pollutants that have adverse effects on human health and the environment: carbon monoxide (CO); lead; nitrogen dioxide (NO_2); ground level ozone; particulate matter; and sulfur dioxide (SO_2). Known as National Ambient Air Quality Standards (NAAQS), these standards established acceptable concentrations of these pollutants in the ambient (outdoor) air. The Clean Air Act established two sets of standards. Primary standards are limits set to protect the health of people, including sensitive population groups. Secondary standards set limits that protect physical structures, plants and animals. This report focuses on the primary standards only.

This report focuses on the primary standards set to protect the health of our population, including groups more sensitive to air pollution.

Health effects from air pollution vary greatly depending on the exposure level, duration of exposure, and the nature of the pollutant. Air quality standards for the criteria pollutants are expressed as an average concentration over a specific period of time (hour, day, year) because the concentration of a pollutant in air varies over time. The standards also specify whether the limit applies to an annual average concentration, a specific percentile, or the number of times the level may be exceeded during the calendar year.

The DEP measures ambient levels of the criteria pollutants through a statewide network of monitoring stations. During 2013, the DEP had monitoring stations in 13 counties to monitor for one or more of the criteria pollutants. These counties were Berkeley, Brooke, Cabell, Greenbrier, Hancock, Harrison, Kanawha, Marion, Marshall, Monongalia, Ohio, Raleigh, and Wood.

Carbon monoxide (CO) is formed any time a carbon-containing compound such as coal, oil or natural gas is burned and is not completely oxidized. Vehicular traffic is usually a leading source of carbon monoxide emissions, although CO levels may also be impacted by certain manufacturing activities. When the standard is exceeded for this colorless and odorless gas, it



Historical Trends of Air Concentrations in West Virginia
(Values are in parts per million except particulates which are micrograms per cubic meter)

(dotted lines represent trends)

can cause dizziness and sluggish reflexes. At higher concentrations it is considered a poison and may be fatal. The standard for this pollutant is 9.0 parts per million (8-hour average) and 35 parts per million (1-hour average). CO is only monitored in West Virginia near a former local industrial emission source in the area of Hancock and Brooke counties. Since these are neighborhood-scale monitors, the data would not be considered either a regional or statewide environmental indicator. The DEP no longer monitors ambient CO in other parts of the state due to historically low concentrations.

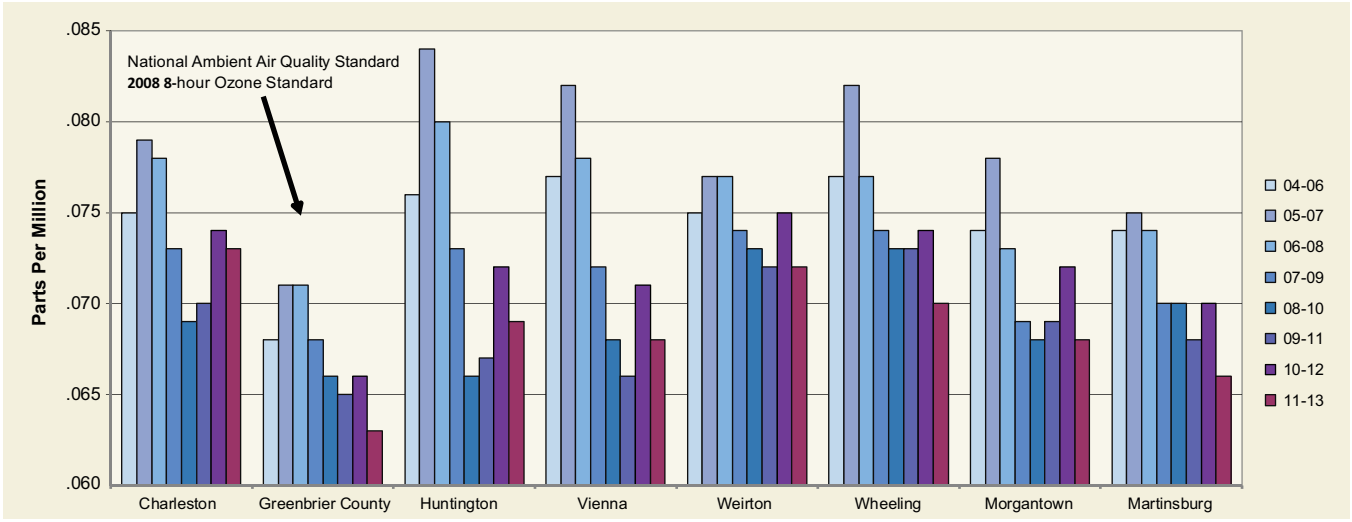
Before the use of lead in gasoline was phased out between 1975 and 1986, vehicular traffic was the leading source of lead emissions.

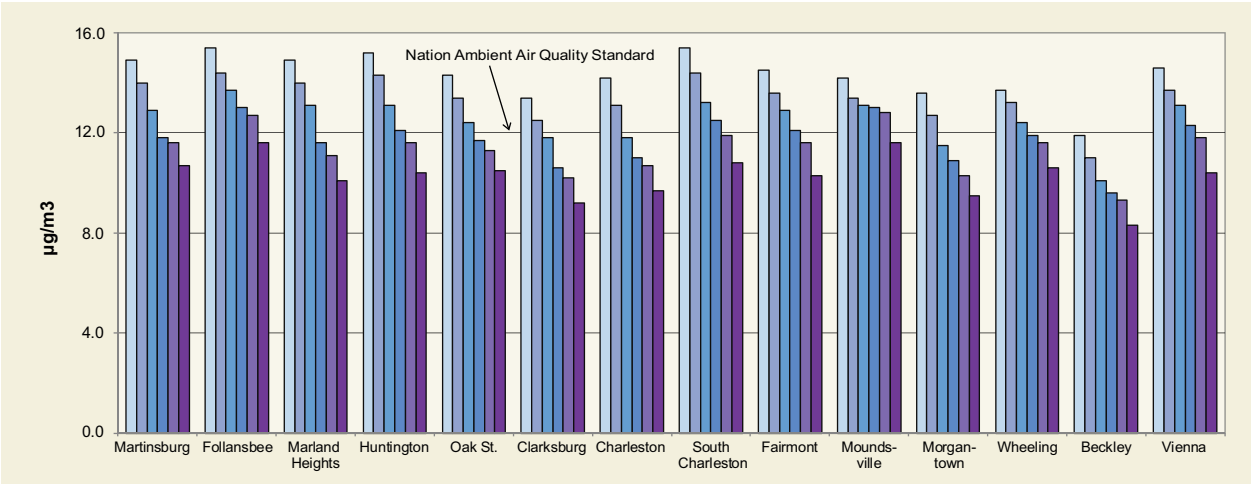
Lead was once used as an additive to gasoline to improve fuel efficiency. Before the use of lead in gasoline was phased out between 1975 and 1986, vehicular traffic was the leading source of lead emissions. Lead exposure is known to cause mental retardation, behavioral disorders and seizures. Even exposure at low levels can cause developmental problems and lowered IQ in children. Due to new information on the health effects of lead emissions from industrial sources, the standard for lead was strengthened in 2008 to 0.15 micrograms per cubic meter (rolling three month average). In 2010, the EPA again revised the standard to require monitoring near industrial sources that emit more than one half ton of lead per year. The DEP began monitoring near one industrial lead source in Cabell County in February 2012. So far, the data collected from this monitor indicates the lead levels are well below the standard. Because the DEP is required to monitor near a local lead source, the data would not be considered a regional or statewide environmental indicator.

Nitrogen dioxide (NO_2) is formed from the combustion of fossil fuels such as coal, oil and natural gas. The leading sources of nitrogen dioxide emissions are power plants and vehicular traffic. NO_2 is a brownish gas that can react with a variety of compounds in the air to form other pollutants which can negatively affect human health if levels exceed the standard. It is also a precursor to acid rain by reacting with water to form nitrous acid and nitric acid.

In January 2010, the EPA established a new 1-hour NO_2 standard at the level of 100 parts

8-hour Ozone 3-year Averages





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

In January 2010, the EPA established a new 1-hour NO_2 standard at the level of 100 parts per billion (ppb) in order to protect people with asthma, children and the elderly.

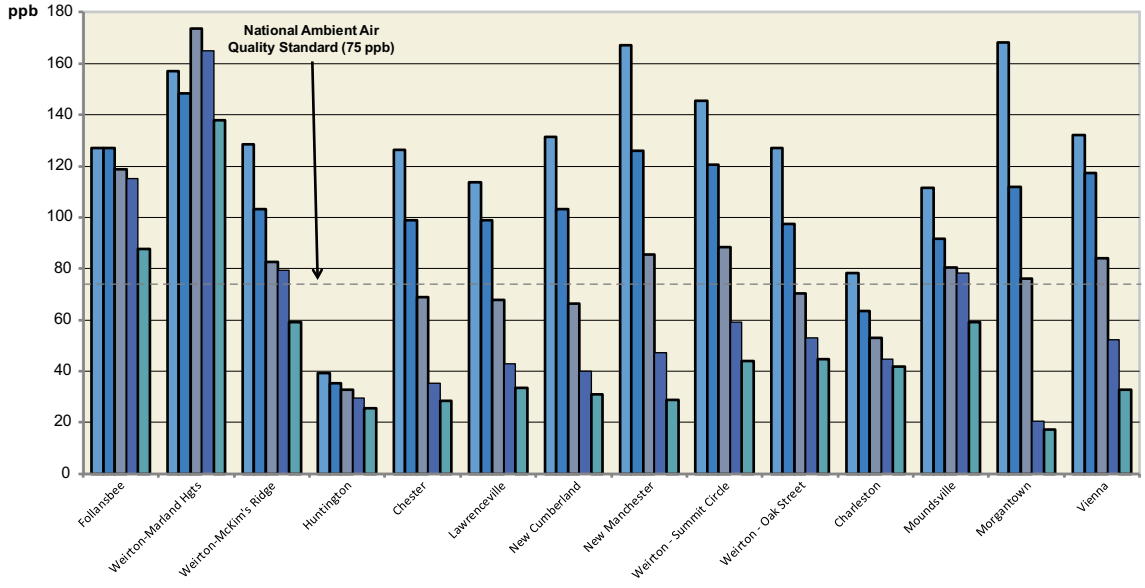
per billion (ppb). The new standard will protect public health, including the health of sensitive populations — people with asthma, children and the elderly. In addition to establishing an average time and level, the EPA also set a new "form" for the standard. The form is the air quality statistic used to determine if an area meets the standard. The form for the 1-hour NO_2 standard is the 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations. The EPA is also retaining, with no change, the current annual average NO_2 standard of 53 ppb. The EPA also established new requirements for the placement of NO_2 monitors in urban areas.

At least one monitor must be located near a major road in any urban area with a population of at least 500,000 people. A second monitor is required near another major road in areas with either a population of at least 2.5 million people, or roads with an annual average daily traffic of at least 250,000 vehicles. The standard also requires that a monitor be placed in any urban area with a population greater than or equal to 1 million people to assess community-wide concentrations. West Virginia does not have any areas that meet the requirements for establishing NO_2 monitoring.

Ground-level ozone is formed in a complex series of sunlight-driven reactions involving nitrogen oxides (NOx) and a class of compounds called volatile organic compounds (VOCs). VOCs come from a variety of sources including vehicular traffic and industrial plants. Since sunlight is needed to generate these reactions, ozone levels are usually higher during the day than at night and higher in the summer than during the winter. Ozone is the main constituent in smog. Ozone levels above the standard can cause difficulty breathing and are especially dangerous for those with existing lung diseases such as asthma or emphysema. Ozone was monitored in eight counties during 2013.

Particulate matter (PM) is solid particles or liquid droplets found in the air. These particles come from a variety of sources and are commonly thought of as dust, soot or mist. At levels above the standard, particulates can cause re-

Volatile organic compounds (VOCs) come from a variety of sources including vehicular traffic and industrial plants.



West Virginia SO_2
3 Year
1-hour Max Averages
(NAAQS = 75 ppb)

Sulfur dioxide, like nitrogen dioxide, is a precursor for acid rain, combining with water to form sulfuric acid. It is also known to damage vegetation.

spiratory problems especially for those individuals with existing lung diseases such as asthma or emphysema. Particulate matter is also a major cause of reduced visibility, or haze. There are two standards for particulates: one for coarse particles less than 10 micrometers in size; and one for fine particles less than 2.5 micrometers. Particles greater than 10 micrometers are likely to be captured and removed by the body's natural defense systems. Particles less than 10 micrometers have a tendency to enter and remain in the respiratory system. The annual standard for PM_{10} was revoked by the EPA in 2006. The short-term, 24-hour PM_{10} standard remains at 150 micrograms per cubic meter.

On Dec. 14, 2012 the EPA revised the annual standard for $PM_{2.5}$ to 12 micrograms per cubic meter. Particulate matter was monitored in 12 counties in 2013.

Sulfur dioxide (SO_2) is formed when sulfur-containing compounds are burned. The leading source of sulfur dioxide emissions is coal-fired power plants. SO_2 is a colorless gas with a harsh odor. At levels above the standard, sulfur dioxide causes respiratory problems especially for those individuals with existing lung diseases. Sulfur dioxide, like nitrogen dioxide, is a precursor for acid rain, combining with water to form sulfuric acid. It is also known to damage vegetation.

In June 2010, the EPA revised the primary SO_2 standard to a level of 75 parts per billion (ppb) measured over a 1-hour period. Adverse respiratory effects include narrowing of the airways, which can cause difficulty breathing (bronchoconstriction) and increased asthma symptoms. These effects are particularly important for asthmatics during periods of faster or deeper breathing (e.g., while exercising or playing). Studies also show an association between short term SO_2 exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses — particularly in at-risk populations including children, the elderly and asthmatics. SO_2 was monitored in seven counties in 2013.

West Virginia Power Plant Emissions

Traditionally, coal-fired electric generating utilities, or power plants, had the highest emissions of nitrogen oxides (NO_x) and sulfur dioxides (SO_2) of any source sector, but emissions of these pollutants have been cut by more than 80 percent in the past two decades. The first major reduction in NO_x and SO_2 emissions from power plants was a result of Phase I of the EPA's Acid Rain Program, promulgated in 1990. Phase I required reductions of these emissions from the nation's largest power plants by 1995. The implementation of Phase II of the Acid Rain Program in 2000 affected the remaining power plants and further reduced emissions of these pollutants.

Additional reductions in the emissions of NO_x and SO_2 from coal-fired power plants have been achieved as a result of the EPA's Clean Air Interstate Rule (CAIR), promulgated in 2005. Although CAIR was remanded by the D.C. Circuit Court in December 2008, CAIR remains in effect until it is replaced. CAIR resulted in significant reductions, even when accounting for emission reductions as a result of the 2008 and 2009 economic downturn. Emissions of SO_2 continued to decease in 2010, even though heat input increased as the economy started to improve. Emissions of SO_2 and NO_x in 2013 decreased 86 and 80 percent, respectively, from 1995 levels, while heat input decreased by only 11 percent. CAIR reductions helped West Virginia to monitor attainment of the 1997 and 2008 ozone standards and the 1997, 2006 and 2012 $PM_{2.5}$ standards.

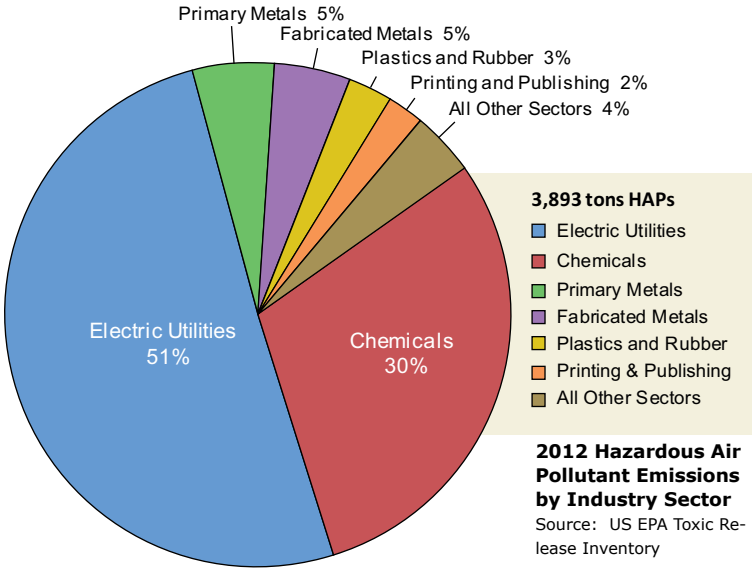
The EPA Mercury and Air Toxics Standards (MATS) for new and existing power plants is anticipated to prevent 90 percent of the mercury in coal burned in power plants from being emitted to the air.

The December 2008 court decision, while keeping the requirements of CAIR in place temporarily, directed the EPA to issue a new rule to implement the Clean Air Act requirements concerning the transport of air pollution across state boundaries. Ultimately CAIR will be replaced, and the replacement rule will continue to help West Virginia meet and maintain the standards for ground-level ozone and fine particulate. Control devices used to achieve reductions of NO_x and SO_2 have the added benefit of reducing mercury and acid gases.

In February 2012, the EPA promulgated Mercury and Air Toxics Standards (MATS) for new and existing power plants, requiring the reduction of emissions of heavy metals, including mercury (Hg), arsenic (As), chromium (Cr) and nickel (Ni); and acid gases, including hydrochloric acid (HCl) and hydrofluoric acid (HF). Nationally, MATS is anticipated to prevent 90 percent of the mercury in coal burned in power plants from being emitted to the air; reduce 88 percent of acid gas emissions from power plants and cut an additional 41 percent of sulfur dioxide emissions from power plants by 2016.

Toxic Air Releases

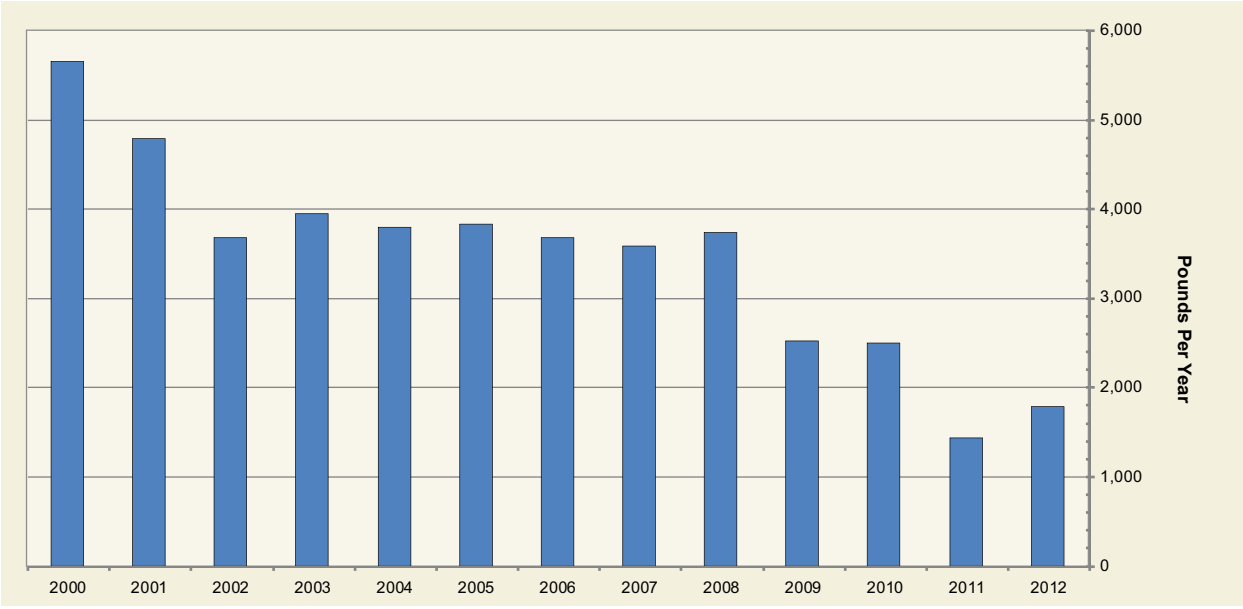
The EPA established the Toxic Release Inventory (TRI) under the federal Emergency Planning and Community Right to Know Act of 1986. The TRI tracks releases of more than 650 different toxic chemicals into the air, water and soil. Toxic chemicals are those that may present a serious hazard to human health or the environment. These compounds include those known to cause cancer and to have other life-threatening health effects. In 1998, the EPA added electric utilities, mining operations, hazardous waste facilities, and chemical wholesalers to the list of industries required to report under TRI. The adoption of these industries, as well as the periodic addition and deletion of chemicals from the reportable list, makes trend analysis difficult.



2012 Hazardous Air Pollutant Emissions by Industry Sector
Source: US EPA Toxic Release Inventory

The graph on Page 4 shows total statewide toxic air releases from 2000 through 2012. During that time, the reporting industries and reportable quantities have remained fairly consistent as air emissions have decreased. The pie chart shows toxic air releases in 2012 by industry sector. Several factors affecting the trends in toxic air releases are changing demands on power output from the electric utilities sector; variability in coal composition; changing emission estimation factors; increased awareness of reporting; and the installation of air pollution control devices on coal-fired power plants. As

Mercury emissions have decreased significantly over the past several years, due in large part to actions taken by coal-fired power plants to reduce NO_x and SO_2.



Mercury and Mercury Compounds Emitted to Air from Electric Utilities

Source: US EPA Toxic Release Inventory

noted in the West Virginia Power Plant Emissions section, mercury emissions have decreased significantly over the past several years, in large part due to actions taken by coal-fired power plants to reduce NO_x and SO_2. A new federal rule affecting existing coal and oil-fired power plants will require additional reductions of hazardous air pollutants, including mercury, by 2016.

Greenhouse Gas Emissions

In a previous State of the Environment report, we noted that the DEP had begun collecting data on Greenhouse Gas (GHG) emissions within the state. Subsequently, the EPA adopted a national GHG mandatory reporting rule in September 2009. This nationwide reporting requirement provides accurate and timely GHG emissions data from facilities that emit 25,000 metric tons or more of carbon dioxide equivalent (CO_2e) per year. The DEP accepts the federal GHG data being collected rather than requiring sources to double report data to West Virginia, as well as to the EPA.

Publicly available data (www.epa.gov/ghgreporting/) allows the public to track emissions, and compare data from similar facilities. In December 2009 the EPA made two distinct findings regarding greenhouse gases under section 202(a) of the Clean Air Act:

- Endangerment Finding: The EPA found that the current and projected concentrations of the six key well-mixed greenhouse gases – carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) – in the atmosphere threaten public health and welfare.
- Cause or Contribute Finding: The EPA found that the combined emissions of these well-mixed greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution which threatens public health and welfare.

These findings did not themselves impose any requirements on industry or other entities. However, these findings were a prerequisite for implementing greenhouse gas emission standards for vehicles. The EPA, in collaboration with the National Highway Traffic Safety Administration, finalized emission standards for light-duty vehicles (2012-2016 model years) in May of 2010 and heavy-duty vehicles (2014-2018 model years) in August of 2011.

In March of 2010, the EPA reconsidered its Dec. 18, 2008 memorandum entitled "EPA's Interpretation of Regulations that Determine Pollutants Covered by Federal Prevention of Significant Deterioration (PSD) Permit Program," and confirmed that any new pollutants that the EPA regulates become covered under the PSD program on the date when the EPA rule regulating the new pollutant takes effect. The EPA clarified that greenhouse gases would become covered under PSD on Jan. 2, 2011, when the light-duty vehicle rule took effect.

In May of 2010, the EPA finalized the Greenhouse Gas Tailoring Rule, which set greenhouse gas emissions thresholds to define when permits under the New Source Review Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs are required for new and existing industrial facilities. The rule "tailors" the requirements of these programs to limit covered facilities to the nation's largest greenhouse gas emitters.

In April of 2012, the EPA proposed a new source performance standard (NSPS) to limit emissions of carbon dioxide (CO_2) from new fossil fuel-fired power plants, including primarily coal- and natural gas-fired units. After consideration of more than 2.5 million comments, the EPA withdrew the proposal for a single NSPS that would have set CO_2 limits for new power plants based on natural gas combined cycle turbine (NGCC) units. In January of 2014, the EPA proposed separate new source performance standards for coal-fired utility boilers and integrated gasification combined cycle (IGCC) units, and natural gas-fired combustion turbines. Currently, the EPA is considering comments on the re-proposed performance standards.

In June 2014, the EPA proposed a regulation that would cut CO_2 emissions from existing coal plants by up to 30 percent by 2030 compared with 2005 levels. Under the draft rule, the EPA presumes that states can use a combination of four general categories of emission reduction measures, which the agency calls "building blocks." These building blocks include power plant improvements, shifting generation from coal to natural gas, investing in renewable energy and demand-side energy efficiency improvements.

Education and Outreach

The DAQ education and outreach team added two new events in 2013. For eight days in July, DAQ staff joined other offices of the DEP to work at the inaugural Boy Scout Jamboree at the Summit Bechtel Reserve near Glen Jean, West Virginia. The Jamboree was attended by over 30,000 Scouts from across the United States and 18 different countries.

Two new displays were developed – the Electrostatic Precipitator (ESP) machine and the BioLite Campstove – as well as a commemorative penny for the DAQ penny press. The ESP machine demonstrated how an induced electrostatic charge controls smoke at a coal-fired

power plant by removing fine particulate matter such as dust and smoke from the stacks. The BioLite Camp Stove showed Scouts how heat from fire can generate electricity via a thermo-electric generator to power a fan creating air-flow for improved combustion and less smoke. The surplus electricity is sent to a USB port for charging electronic devices, even in the middle of camp with no electricity.

"Envirojam," a multi-cache geocaching exercise with environmental questions, was created for interested Scouts. A patch was awarded to Scouts who completed the multi-cache and a magnet awarded to those who participated.

In December 2013, the DAQ turned the entire DEP headquarters into its newest outreach display. The DEP Energy Tree allowed the public to provide the power, via hand crank, to light up a traditional 100-bulb incandescent tree versus an 800-plus light, 35-foot LED tree, draped to the side of the DEP building, again bringing home the DAQ's core outreach message – "Save Money, Save Energy, Save the Environment." The tree was available every evening from Dec. 6, 2013, through Jan. 6, 2014.

Diesel Emissions

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.

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.

The DAQ education and outreach team spent eight days in July, 2013 at the National Boy Scout Jamboree in Fayette County.

The agency uses the Water Management Framework as a tool to, not only assess waters, but also to implement water quality improvement plans on each of the state's 32 watersheds.

Water Quality

The DEP implemented the Watershed Management Framework in 1996, creating a five-year cycle to collect comprehensive water quality data.

West Virginia's Aquatic Integrity

West Virginia has many miles of high-quality streams that support healthy communities of aquatic organisms. Many of these streams are the raw water sources for the state's drinking water suppliers, as well as for the construction, manufacturing, chemical, power generation, mineral extraction, and agricultural industries. Recreation in and around West Virginia's waters contributes significantly to the state's economy. However, many stream miles are impaired by a variety of pollutants. Leading causes of impairment include mine drainage constituents (like acid and iron), sewage and livestock waste (like nutrients and pathogens), sediment, and streamside habitat destruction.

Water Resources Information - West Virginia	
2013 est. state population (U.S. census)	1,854,304
WV Land surface area (sq. mi.) (U.S. Census).	24,078
Number of major watersheds	32
Total river & stream miles (1:100K scale USGS)	32,278
Perennial stream miles (flow year round)	21,114
Intermittent stream miles (may dry)	11,164
Stream miles on state border	619
Number of public lakes, reservoirs, & ponds	108
Total wetland acres	102,000

Ecological Assessments of Aquatic Integrity

In 1997, the DEP's Watershed Assessment Branch began sampling sites selected through the Environmental Protection Agency's random stratified procedure in order to better assess the ecological health of watersheds and ecoregions within the state. The data generated from this random stratified (also known as probabilistic) sampling effort allows the DEP and the EPA to make statistically valid comparisons of aquatic integrity between watersheds and ecoregions. The data also assists in monitoring long-term trends in watershed and ecoregion health.

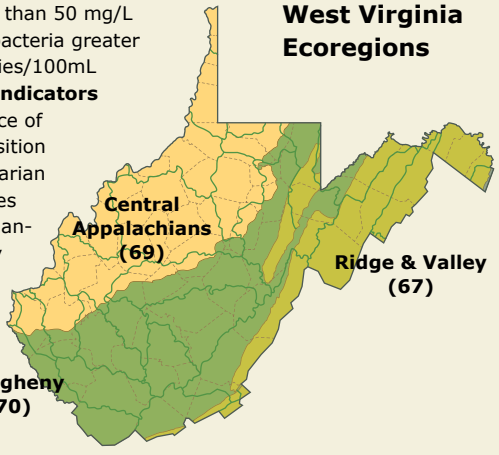
Sites are assessed using three broad categories of aquatic integrity indicators.

The probabilistically selected sites are assessed using three broad categories of aquatic integrity indicators: biological community quality; water quality; and habitat quality. From these, several individual indicators were chosen to help illustrate the condition of West Virginia's rivers and streams during the periods of interest in this report. They are presented for statewide and the three "ecoregions" in the figure below:

Biological
- West Virginia Stream Condition Index (WVSCI)

Water Quality Indicators
- pH less than 6.0 standard units
- Sulfate greater than 50 mg/L
- fecal coliform bacteria greater than 400 colonies/100mL

Habitat Quality Indicators
- relative presence of sediment deposition
- condition of riparian vegetation zones
- a range of human-refuse intensity values



With the exception of the Designated Use Support Section, the data used to create the charts presented in this report is from the last five years of available probabilistic data (2009-2013) and are described in terms of

ecoregions. It should be noted that these estimates of condition are descriptive of smaller wadeable streams where our probabilistic monitoring efforts are focused.

Biological Community

Benthic macroinvertebrates are bottom-dwelling organisms with no backbones, and are visible with the naked eye.

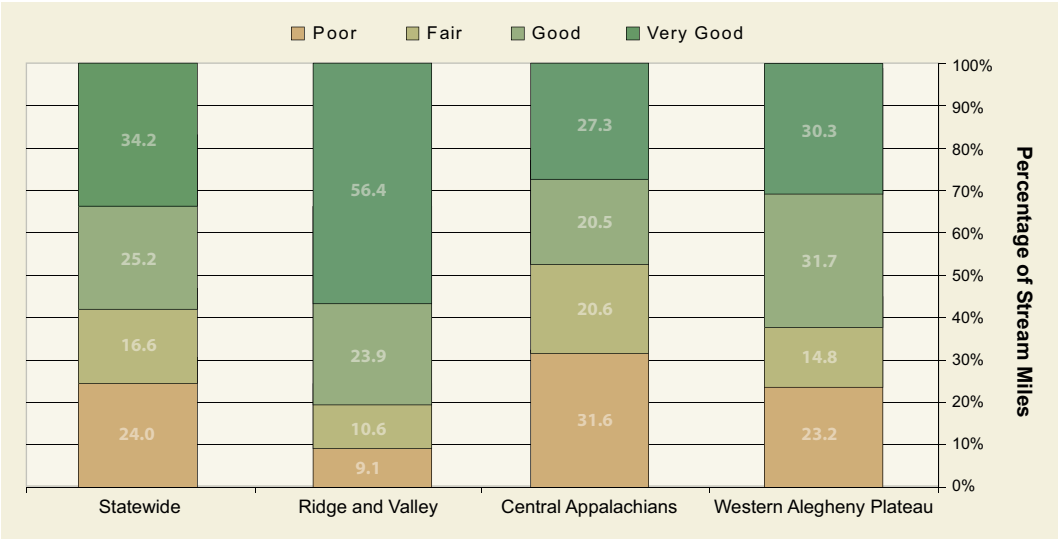
The biological communities living in West Virginia streams are exposed to many stressors, including toxic contaminants, sedimentation, nutrient enrichment, and acid precipitation. The DEP uses benthic macroinvertebrates to assess the biological condition of streams in the state. These organisms provide reliable information on water and habitat quality in streams and have been used as indicators all over the world for nearly 100 years. They are extremely diverse and exhibit a wide range of tolerances to pollutants. Further, they serve as an excellent tool for measuring overall ecological health, especially when summarized into a single index of biological integrity.

In West Virginia prior to 2012, the health of benthic macroinvertebrate communities had been rated using a statewide family-level multimetric index developed for use in wadeable riffle/run streams, the West Virginia Stream Condition Index (WVSCI). Beginning in 1998, the DEP started identifying benthic macroinvertebrates to genus level with the intention of eventually developing a new biotic index. Development of a genus level index is now complete. The new tool, known as GLIMPSS (Genus Level Index of Most Probable Stream Status), which is stratified by season and ecoregion, has now been peer reviewed and published and is ready for use in this summary report.

However, the new index is not yet ready for use in determining attainment of a stream's Aquatic Life Use (AQL) for regulatory purposes. During West Virginia's 2012 legislative session, Senate Bill 562 was passed. This legislation requires the DEP to develop new assessment methodology that will be subject to legislative approval. The process to develop and evaluate options for assessing stream health more "holistically" is ongoing, and specifically considers the use of fish community information, along with benthic macroinvertebrate index scores, as part of the assessment methodology.

GLIMPSS, similar to WVSCI and other indices of biotic integrity, summarizes scores of various metrics into a single index value. The metrics were selected to maximize discrimination between streams with known stressors and reference streams. Reference streams have little or no human disturbances. All identified reference streams were combined and a subsequent reference condition was established based on their benthic macroinvertebrate communities. Based on the probabilistic data utilized in this summary and a comparison to low-end reference condition (5th percentile of all appropriate season and ecoregion reference sample GLIMPSS scores), 59.4 percent of wadeable stream miles are comparable to reference condition statewide with the remaining 40.6 percent scoring less than this threshold. Breaking this down by ecoregion, the Ridge and Valley ecoregion has the highest percentage of streams with healthy aquatic ecosystems, with 80.3 percent scoring above the 5th percentile threshold.

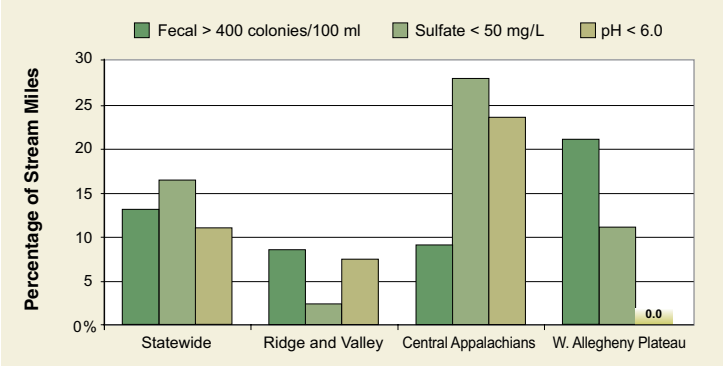
The Western Allegheny Plateau ecoregion is estimated to have 62.0 percent of stream miles comparable to reference, which is a greater percentage than estimated in the past (42.5) when based on WVSCI. The percent of stream miles in the Central Appalachians scoring above the GLIMPSS threshold is estimated to be 49.7 percent which is lower than previous estimates (65.3) based on WVSCI.



Stream Biological Condition
based on Benthic Macroinvertebrate Community

Water Quality Indicators of Aquatic Integrity

The Watershed Assessment Branch analyzes over 20 different water quality parameters at each of the sites sampled as part of the probabilistic monitoring program. Below are the results of three of these parameters.



Percent of stream miles that exceeded water quality indicator values

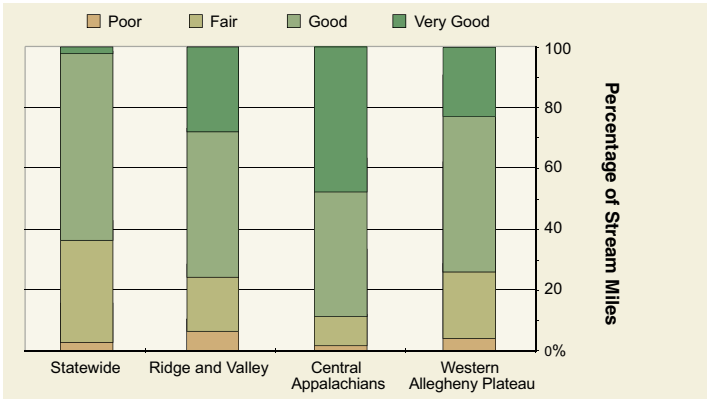
Fecal coliform bacteria analysis provides an indication of the amount of human or animal wastes present in waterbodies. The chart shows that 13.6 percent of stream miles had fecal coliform levels above 400 colonies/100mL at the time of sampling. The Western Allegheny Plataeu Ecoregion had the highest percentage with high bacteria counts at 21.3 percent of stream miles.

Sulfates are typically fairly low in West Virginia unless there are large land disturbances (such as surface mining and road construction) that allow rainwater to percolate through fractured rock. The chart shows the percent of stream miles that had sulfate levels above 50 mg/L. The Central Appalachian Ecoregion, with its extensive history of coal mining, had the highest percentage (27.3) of streams with sulfate greater than 50 mg/L.

Low pH or acidic conditions are found in areas that are vulnerable to the effects of acidic precipitation as well areas with untreated mine drainage. The Central Appalachian Ecoregion had the highest percentage of acidic waters (24.0 percent). This region includes the poorly buffered headwaters of the Gauley, Little Kanawha, Elk, Tygart, and Cheat River watersheds.

Habitat Indicators of Aquatic Integrity

The chart titled "Embeddedness" shows the extent to which rocks (gravel, cobble, and boulders) are covered or sunken into the silt, sand, or mud of the stream bottom. Generally, as rocks become embedded, the surface area available to macroinvertebrates and fish for shelter, spawning, and egg incubation is decreased. Ecoregion 70 had the highest percentage of streams with poor or fair ratings (36.4 percent)

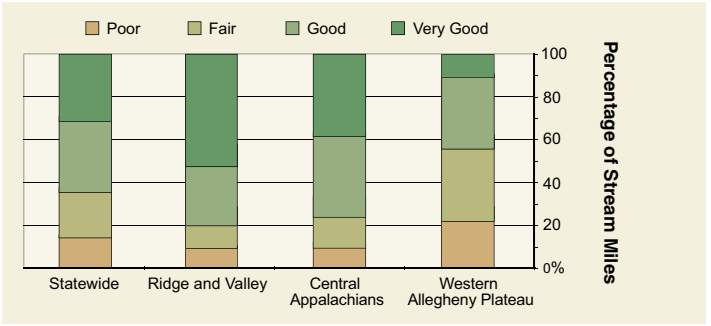


Embeddedness

for embeddedness. This is likely because this region has slower, low-gradient streams, has more erodible soils, and more land-disturbing activities than in other areas.

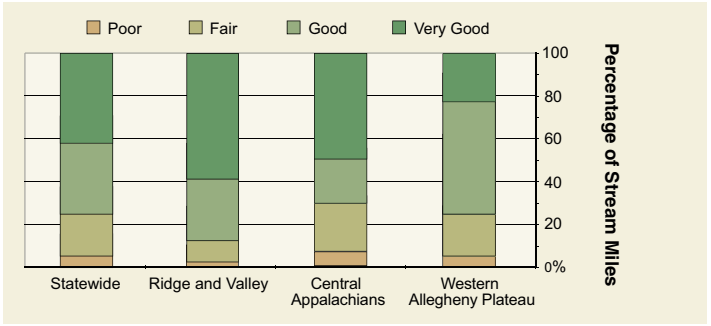
Ecoregion 69, the Central Appalachians, had the highest percentage of wide undisturbed riparian zones. This indicator rates streamside zones on the amount of undisturbed vegetation present, which is desirable for providing shade, creating a more stable stream bank and minimizing the amount of sediment, excess nutrients and other pollutants entering the stream.

Riparian Zone Vegetation Index



The "Trash/Aesthetic Index" is a measure of the amount of human refuse that is in and around the stream (including that which could be washed into the stream at high flows). Ecoregion 67, the Ridge and Valley Ecoregion, has the highest percentage of "clean" streams, with almost 60 percent of stream miles in the "very good" category.

Trash/Aesthetic Index



The scale showing three underwater stream photographs helps illustrate the range of Embeddedness impacts encountered across the state.

Embeddedness Index

Poor: Gravel, cobble and boulder particles are over 75% surrounded by fine sediment.

2 3 4 5

Fair: Gravel, cobble and boulder particles are between 50 and 75% surrounded by fine sediment.

6 7 8 9 10

Good: Gravel, cobble, and boulder particles are between 25 and 50% surrounded by fine sediment.

11 12 13 14 15

Very Good: Gravel, cobble and boulder particles are between 0 and 25% surrounded by fine sediment; layering of cobble provides a diversity of niche space.

16 17 18 19 20

Mud River/Guyandotte Watershed (WVOGM) Embeddedness Score = 5 (Poor)

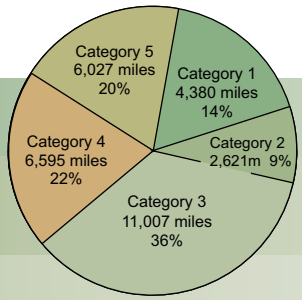
Big Horse Creek/Coal Watershed (WVKC-10-I) Embeddedness Score = 10 (Fair)

Big Run/South Branch Potomac Watershed (WVPSB-28-EE) Embeddedness Score = 19 (Very Good)

Designated Use Support

Designated uses refer to those stream uses outlined in Title 47CSR2, Requirements Governing Water Quality Standards. Examples include warm water fishery, public water supply, and water contact recreation, including swimming and skiing, etc.

Waterbodies fall into five categories of support for their designated uses



Category 1 fully supporting all designated uses.

Category 2 fully supporting some designated uses, without sufficient data to assess other designated uses.

Category 3 insufficient data to determine if any of the uses are met.

Category 4 waters that are impaired or threatened, but do not need a TMDL plan developed.

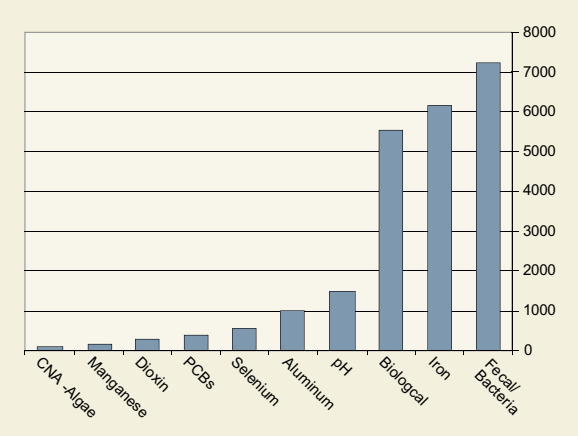
Subcategory 4a waters that already have an approved TMDL plan, but still do not meet designated uses.

Subcategory 4b waters with control mechanisms in place that are expected to restore the waters to designated uses.

Category 5 impaired waters expected to need a TMDL plan developed.

Data source - Final 2012 Integrated Report

Section 303(d) of the federal Clean Water Act required the compilation of streams and other bodies of water that do not meet their designated uses due to impairments by various causes. The primary reason for developing 303(d) lists is to formulate plans to restore impaired waters to their designated uses.



Stream Miles Impaired by Reason for Listing

includes Category 4 & Category 5 (Impaired) Streams

Such plans include the determination of total maximum daily loads of pollutants allowed in the impaired waters.

Leading Sources of Impairment

The chart titled "Stream Miles Impaired by Reason for Listing" shows fecal coliform bacteria as the most extensive reason for listing streams as impaired. Biological impairment reflects a low score (< 68) on the WV Stream Condition Index (see the discussion under the section titled Ecological Assessments of Aquatic Integrity).

Toxic Releases to Surface Water

The EPA's Toxic Release Inventory (TRI) Program tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. The chart below represents toxic chemical releases to West Virginia surface waters that were reported to TRI in the past five years by industry sector. Electronic fact sheets with TRI data are available at: *http://www.epa.gov/triexplorer/.*

Toxic Releases to surface water by Industry Sector (in pounds)

Industry	2008	2009	2010	2011	2012
Chemicals	1,066,244	880,507	1,225,094	1,158,341	1,513,944
Coal Mining	450,870	246,965	450,780	307,594	258,440
Food/Beverage/Tobacco	238,365	188,777	178,638	160,194	204,562
Primary Metals	139,312	137,048	188,876	142,760	144,528
Electric Utilities	76,765	47,210	57,890	56,555	36,724
OSHA Carcinogens	14,322	12,231	16,245	20,555	18,451
Stone/Clay/Glass	120	138	2,065	2,035	2,983
Petroleum Bulk Terminals	295	290	281	285	285
Fabricated Metals	67	57	46	118	100
Wood Products	39	54	32	20	12
Plastics and Rubber	11	11	11	11	11
Electrical Equipment	2	2	3	1	2
Misc. Manufacturing	32	9	1	0	0
Petroleum	9	5	11	0	0

Above Ground Storage Tank Chemical Spill into Elk River

On the morning of Jan. 9, 2014, inspectors from the Department of Environmental Protection's Division of Air Quality responded to citizens' complaints of a licorice-like odor near Barlow Drive in Charleston. A site visit led the DAQ inspectors to the Freedom Industries storage tank facility along the Elk River, where they discovered a tank on the property was leaking a coal-processing chemical called 4-Methylcyclohexane Methanol (MCHM).

Further inspection by the DEP revealed that not only was the chemical leaking from tank No. 396, it also was breaching a dilapidated secondary containment wall at the facility and spilling into the Elk River, approximately 1.5 miles upstream from the intake to West Virginia American Water's Charleston treatment plant.

Early estimates by Freedom Industries had the spill volume between 5,000 and 7,500 gallons of MCHM, but were later modified to approximately 10,000 gallons by the company. Also, nearly two weeks after the incident, Freedom revealed that a second chemical, PPH, had also leaked from the faulty tank.

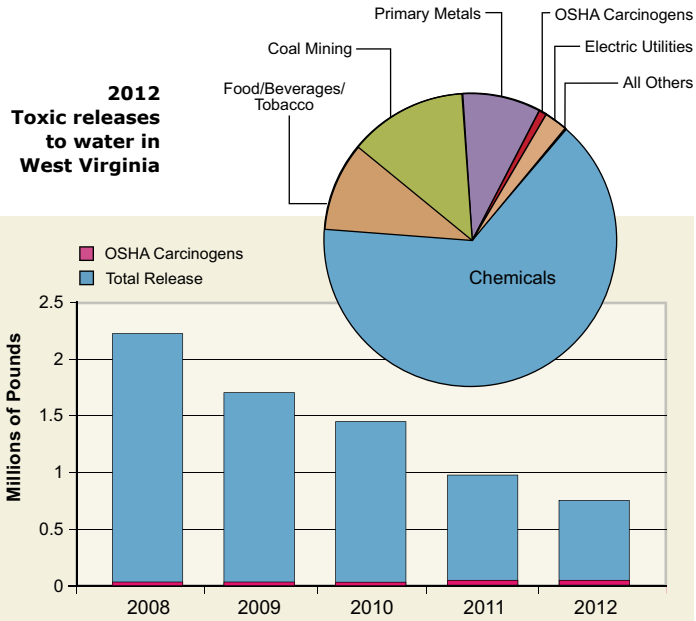
By 5:15 p.m. on the day of the spill, officials at West Virginia American Water, along with Gov. Earl Ray Tomblin, announced that the treatment facility had not been able to effectively remove the chemicals through the water treatment process and a "Do Not Use" order was issued to a nine-county region. More than 300,000 West Virginia American Water users were affected, advised only to use their water for flushing toilets or for fire protection. President Obama signed a disaster declaration for the region and the West Virginia National Guard, along with other federal and state agencies, began distributing water to residents in the impacted counties.

After a 1 part per million health threshold for MCHM in drinking water was set by the U.S. Centers for Disease Control and Prevention (CDC), the state began lifting the "Do Not Use" order by zone on Jan. 13. West Virginia American Water provided guidance to its customers on how to properly flush their systems of contaminants. On Jan. 28, the National Guard began testing tap water in all affected schools for the chemical down to 10 parts per billion and later to 2 parts per billion, well below the CDC threshold.

As a result of the spill, Gov. Tomblin ordered Freedom Industries, which ultimately declared bankruptcy, to dismantle and remove all of the aboveground storage tanks at its Elk River facility. The Freedom chemical spill also led to new legislation. In March 2014, the West Virginia Legislature passed Senate Bill 373 (the "Tank Bill"), which established a new regulatory program for aboveground storage tanks and instituted registration and inspection requirements for tank owners.

13

2012 Toxic releases to water in West Virginia



Comparison of OSHA Carcinogenic Releases to Total Toxic Water Releases

Wastewater Treatment

The availability of publicly owned wastewater collection and treatment facilities is a key determinant in defining the health and water quality of a community. Residents without access to public sewer systems either rely on individual sewage systems or pipe the untreated sewage directly into streams. Inadequate or untreated sewage can have severe environmental and health implications and can impair water quality with disease-causing bacteria, metals and nutrient-laden effluent. Reducing or eliminating these risks through development of publicly owned wastewater collection and treatment systems is a fundamental part of the federal Clean Water Act and state environmental law. The DEP's Clean Water State Revolving Fund plays a major part in this effort by supplying low-interest loans to West Virginia entities for the planning, design and construction of wastewater treatment works.

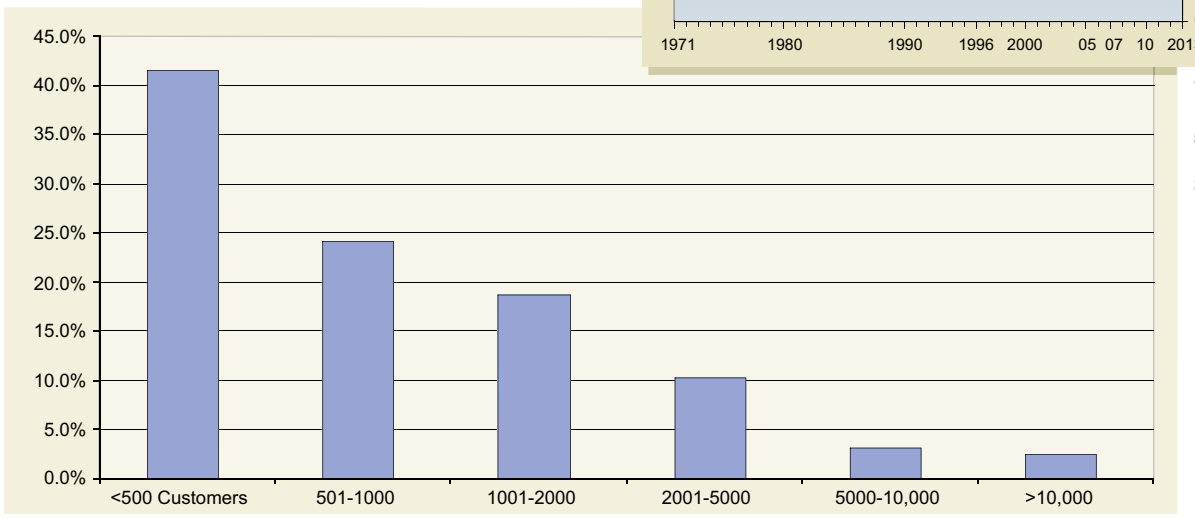
Many West Virginia municipalities are also struggling with problems associated with combined sewer systems and wet weather overflows. After a heavy rain or snow melt, excess water entering combined systems can easily exceed the capacity of these lines and, mixed with sewage, exits the system through overflows directly into streams. In addition, wastewater treatment plants can be burdened to the point where sewage bypasses may occur at the plant and inadequately treated sewage is discharged.

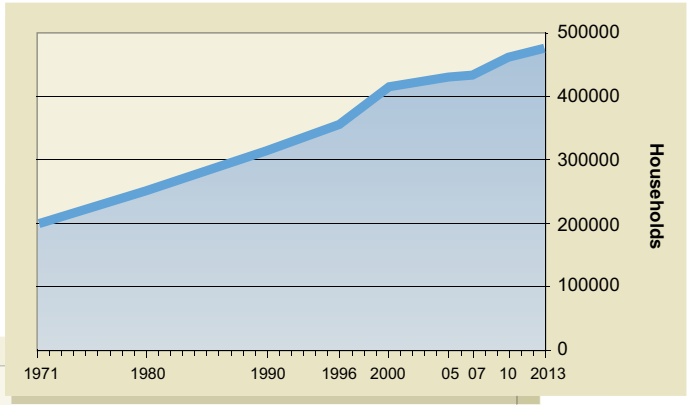
From 2011-2013, 15 communities have provided sewer service for the first time to 1,684 residents, who previously relied on septic tanks, direct pipes into streams, or other inadequate means of treatment as a means of sewage disposal. Three of these 15 communities had no sewer system at all prior to their projects. Twenty-five other communities serving 270,993 residents have upgraded their facilities to provide a better degree of treatment which has reduced the amount of pollutants discharged to receiving streams.

The chart below on existing sewer systems indicates that the vast majority of wastewater

The graphs below summarize the progress being made toward providing adequate wastewater service to our citizens and also describe the tremendous future needs that still must be met.

Wastewater Systems by number of customers served





West Virginia Households served by a Public Sewer System

systems serve a very small customer base. Over 40 percent of the systems serve fewer than 500 customers, 65 percent serve fewer than 1,000 customers and over 94 percent serve fewer than 5,000 customers. This is a true indication of the continued rural nature of our state and the inherent challenges that nature poses for providing adequate centralized collection and treatment. It is estimated that 443,498 households or customers are now served by a public sewer system. This is over 1.1 million of the citizens of West Virginia or over 60 percent of our population.

Fish Consumption

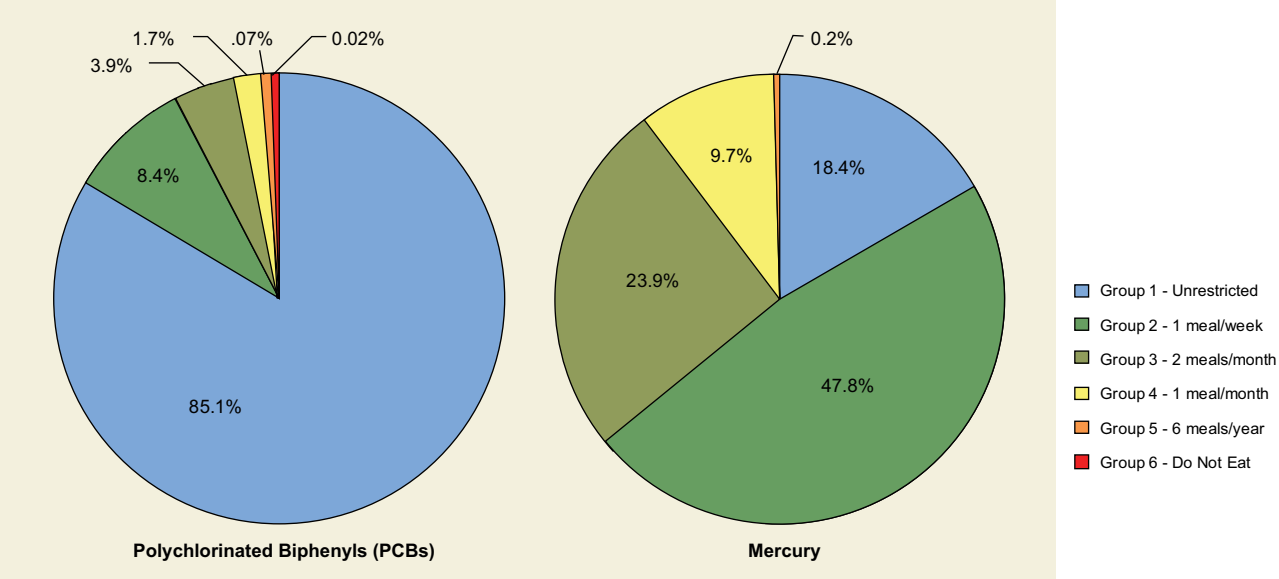
The narrative water quality criterion of 47CSR2-3.2.e prohibits the presence of materials in concentrations that are harmful, hazardous, or toxic to man, animal, or aquatic life in state waters. Fish consumption advisories are used to inform the public about potential health risks associated with eating fish from West Virginia's streams. These advisories are developed and issued in accordance with an interagency agreement between the DEP, Division of Natural Resources, and the Bureau for Public Health.

West Virginia's fish consumption advisories include guidelines on the number of meals to eat and information on proper fish preparation to further minimize risk. There are currently waterbody-specific fish consumption advisories on 12 state streams plus the Ohio River and five lakes for a variety of fish species and contaminants. The risk-based approach estimates the probability of adverse health effects and provides a statement on the health risk facing the angler and high-risk groups including women of childbearing age and children. There is a general statewide advisory that recommends limiting the consumption of sport-caught fish from all West Virginia waters in relation to low-level mercury and/or polychlorinated biphenyl (PCB) contamination. The statewide advisory provides species-specific recommendations ranging from one meal per week to one meal per month. The pie charts below represent a summary of fish tissue data collected since 2002 (first statewide study) and used to generate statewide advisories and waterbody specific advisories. It should be noted that sampling is biased toward waters perceived to be most at risk of contamination and that results should not be considered representative of all waters For a comprehensive fish advisory list, visit the Department of Health and Human Resources online at www.wvdhhr.org/fish.

Water Quantity and Water Use

The Water Use Section of the DEP submitted the Water Resources Management Plan for the state on Nov. 22, 2013, in accordance with the Water Resources Protection and Management (WRPMA) Act, Chapter 22, Article 26, of the West Virginia Code. Based on data DEP has collected in developing this Plan and its companion tools, there are 388 registered Large Quantity Users in West Virginia, whose average annual water demands are approximately 1.2 trillion gallons (excluding use by hydroelectric facilities). West Virginia is blessed with an abundance of water and receives approximately 19 trillion gallons of precipitation annually (an average of 44 inches per year). West Virginia has approximately 54,961 stream miles; 6,017 mine pools that could contain another possible 1.5 trillion gallons; and 399 fresh water lakes containing approximately 389 billion gallons of

Fish Consumption Advisories
Percent of samples in each meal category

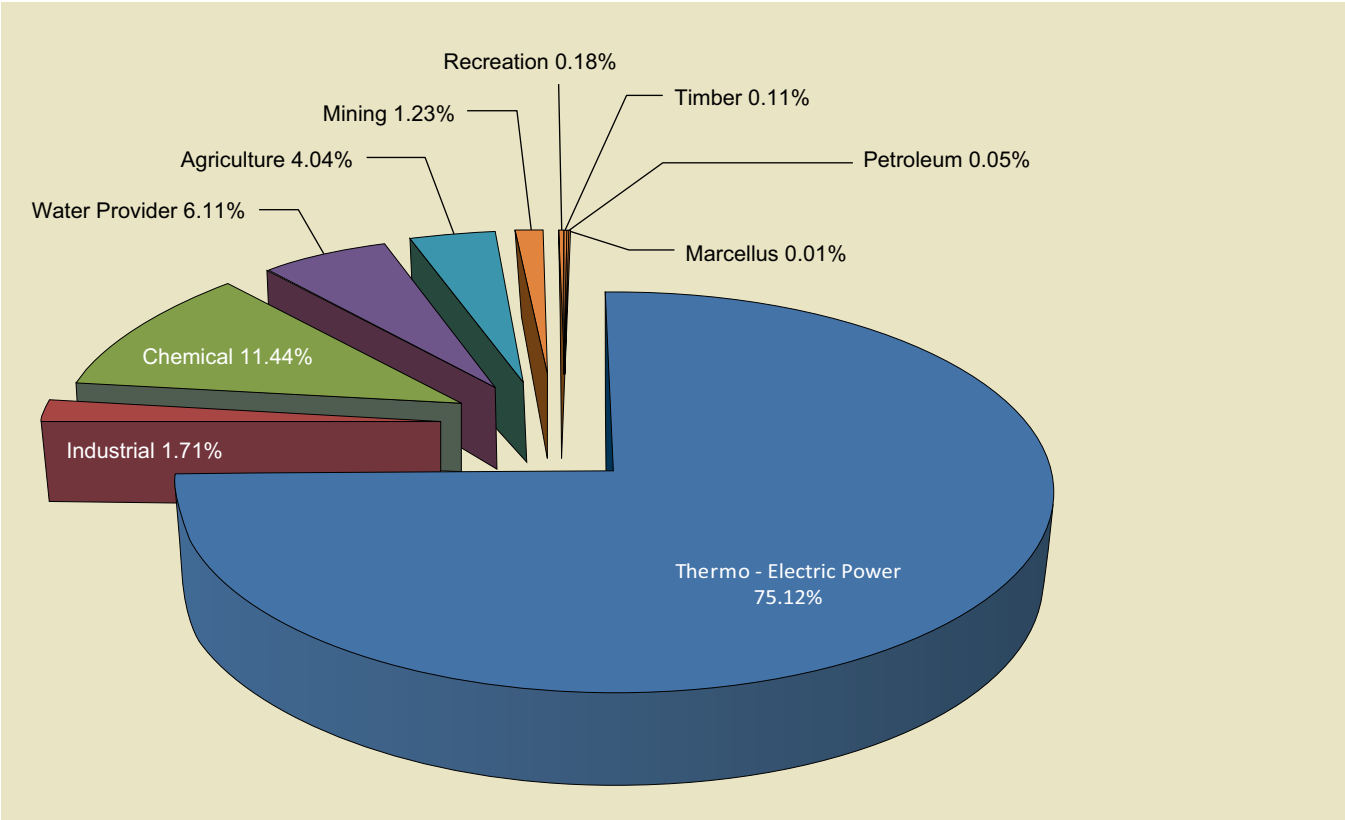


normal storage. A water budget estimated that the state's river systems can supply an additional average of 42 billion gallons of water per day. On average, the state's consumptive use is six percent of the total annual water withdrawn.

The Water Resources Management Plan details past flooding and drought in the state, examines water infrastructure needs, describes the need for continued stream gaging and includes projections of future water use. The Plan also suggests continued improvements to the state's data collection and reporting procedures, which would lead to increased understanding of the state's water resources. Future duties of the Water Use Section include coordination with state and federal agencies, state, county and municipal governments, planning commissions, state universities, industrial associations, watershed organizations, trade organizations, large quantity users and businesses to develop and implement the State Water Management Plan. The Water Use Section also will prepare and present annual progress reports to the Joint Legislative Oversight Commission on Water Resources and to the Joint Judiciary Committee. It will also assess the future water resource needs including availability, consumptive use, and capabilities of water supply entities to meet those needs. It will assess structural and non-structural alternatives to meet projected water use needs and to create an infrastructure to define and delineate the groundwater aquifers across the state, quantify the total available waters of the state, identify the large quantity water users and to make recommendations to the state Legislature for the best management of the state's water resources in the future. The first phase mine pool atlas has been published and several projects have been initiated and will be added to the results of that study. One project is a mine pool water quality survey and the other is a ground water well geophysical well logging project.

The Water Use Section will continue to review all Water Management Plans required for horizontal drilling of gas wells. These duties also include statewide tracking of hydro-fracturing water used in the horizontal well drilling industry. Water is essential both to life and to West Virginia's economy and will forever increase in value. Because of the WRPMA, West Virginia now has a set of tools to protect this valuable resource located at *http://dep.wv.gov/WVWaterPlan/.*

West Virginia Water Use
by percent
excluding
hydroelectric
flowthrough



Examples of High Quality West Virginia Streams

These streams are considered examples of high-quality streams because they have a high West Virginia Stream Condition Index (WVSCI) score and because they have an overall high physical habitat quality score.

The WVSCI denotes the overall health of a stream based on the presence of benthic macroinvertebrates.

Stewart Run/Tygart Watershed Score 93.6

Big Run/South Branch/Potomac Watershed Score 91.6

West Virginia Watersheds

Laurel Creek/Cherry River/Gauley Watershed Score 89.3

Crane Creek
Tug Fork Watershed
Score 98.8

Land

A legacy of environmental problems from past practices has led to the creation of multiple cleanup programs.

Since the late 19th Century, West Virginia's economy has been based largely on manufacturing and natural resource industries that contributed significantly to the nation's growth. As a result, a legacy of environmental problems from these past practices has led to the creation of multiple cleanup programs. The DEP has continued efforts in coordinating cleanup programs to provide sound, effective remedies using the best available scientific and technical approaches. The goal is to eliminate separate, redundant, and potentially inconsistent cleanup standards and procedures for cleanup projects conducted under different regulatory programs.

The DEP continues to pursue steps to ensure safe and protective cleanup efforts, having adopted provisions of the West Virginia Uniform Environmental Covenant Act, continuing the participation in the One Call utility notification program as a member of MISS Utility of West Virginia, and continuing to develop measures to establish a long-term stewardship program to help ensure the long-term compliance with applicable land use restrictions. The newly-created nonprofit West Virginia Land Stewardship Corporation will serve as a vehicle to bring together long-term stewardship of environmental covenants and other site use restrictions, provide site certification services to ensure remediated sites are shovel-ready, and establish a land bank program to encourage site reuse.

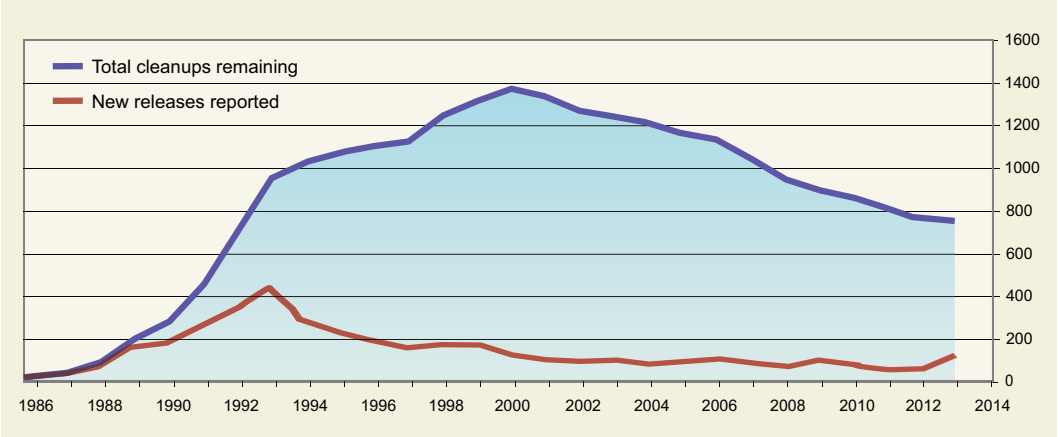
The DEP maintains an extensive list of sites with potential contamination requiring remediation. The list includes sites in the federal Superfund program, including those with enough contamination to be designated as National Priority List Sites. *See list below*

Leaking Underground Storage Tanks

Leaking underground storage tanks can act as point sources for shallow groundwater contamination. Until the mid-1980s, many underground storage tank (UST) systems were made of bare steel that corroded and then leaked. Faulty installation and inadequate operating and maintenance procedures can also result in tank system leaks. Depending on the amount of fuel released, the hydro-geologic properties of the aquifer impacted by the release, and the location of nearby public drinking water sources, public water supplies can be threatened or directly impacted. West Virginia has 4,692 active underground storage tanks, and 20,600 tanks have been closed by being removed from the ground or properly filled in place with an inert solid since the program's inception in 1984. Since 1984, there have been 3,468 confirmed

Since 1984, there have been 3,468 confirmed releases from underground storage tank systems, with 19 emergency responses related to underground tank leaks.

National Priority List Sites	***City***	***County***
Allegany Ballistics Lab	Short Gap	Mineral
Big John Salvage - Hoult Road Site	Fairmont	Marion
Fike Chemical, Inc	Nitro	Kanawha
Hanlin-Allied-Olin	Moundsville	Marshall
Ordnance Works Disposal Area	Morgantown	Monongalia
Sharon Steel Corporation (Fairmont Coke Works)	Fairmont	Marion
Vienna Tetrachloroethene	Vienna	Wood
West Virginia Ordnance	Point Pleasant	Mason
Ravenswood PCE	Ravenswood	Jackson



Total Leaks from Underground Storage Tanks

releases from underground storage tank systems, with 19 emergency responses related to underground tank leaks.

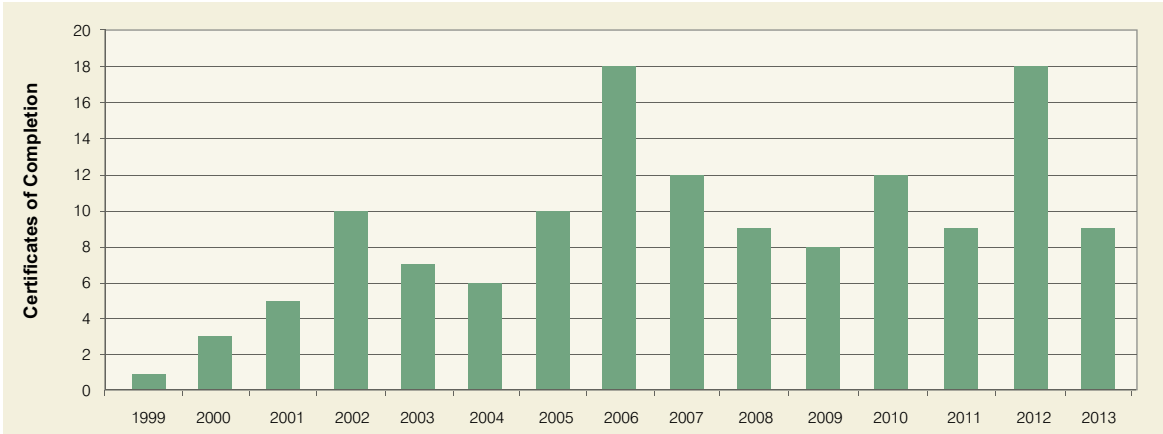
More than 2,735 of the leaking UST system cleanups have been completed during this period, with 733 yet to be completely remediated and the files closed. During the past decade the number of new releases from UST systems has remained below 100 per year, and because of the required leak detection monitoring of the UST systems, the impacts from new leaks have tended to be less severe. Recent changes in gasoline formulation and the increased use of ethanol, has caused concerns for compatibility with existing UST system components, as well as the fate and transport of contamination when increased ethanol-formulated gasoline releases occur. Vigilant leak detection monitoring and aggressive clean-up responses to new releases will be necessary with the higher ethanol blends, to protect ground water resources.

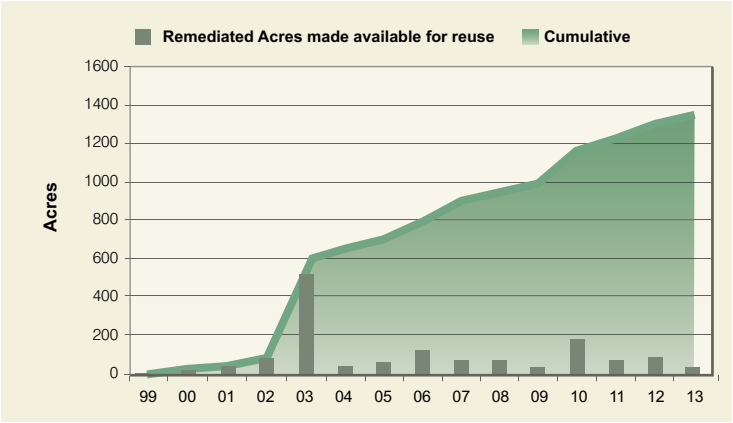
Voluntary Remediation Sites

The abandonment or under-use of contaminated or potentially contaminated industrial sites results in inefficient use of public facilities and services and increases the pressure for development of uncontaminated pristine land. Because existing industrial areas frequently have transportation networks, utilities, and an existing infrastructure, it can be less costly to society to redevelop existing industrial areas than to relocate amenities for industrial facilities at pristine sites. The Voluntary Remediation Program was established to facilitate voluntary remediation activities and brownfield revitalization. The DEP Voluntary Remediation Program has matured as a structured and predictable mechanism to achieve compliance with applicable state and federal environmental requirements, while promoting the reuse and redevelopment of former industrial and mine-scarred properties. Since the program's inception in 1997, over 220 sites have entered the program, and more than 1,300 acres of land have been remediated for productive reuse.

The DEP has promoted an active partnership with the Northern and Southern Brownfield Assistance Centers located at West Virginia University and Marshall University, respectively. The assistance centers empower communities to plan and implement brownfields redevelopment projects by conducting general citizen and local government education efforts, and by providing assistance to specific local communities interested the reuse of brownfields in their

DEP Voluntary Remediation Program Certificates of Completion





Remediated Acres made available for Reuse by year plus Cumulative Remediated acres made available for reuse

communities. Support can be provided to help groups solicit grants and low-interest loans for site assessments, clean-ups, and environmental job training, as well as provide support for preliminary legal and planning work. The assistance center's support to communities in developing competitive grant applications for submittal to EPA has resulted in the award of assessment and clean-up grants totaling well in excess of $4 million for West Virginia communities. The DEP and the assistance centers have jointly participated in annual state Brownfield Conferences and have conducted informational workshops.

RCRA Corrective Action

The DEP continues to work collaboratively with the EPA to implement the RCRA Corrective Action Program, which requires the investigation and cleanup of releases of hazardous wastes and hazardous constituents that pose an unacceptable risk at RCRA hazardous waste treatment, storage and disposal facilities. Facility evaluations are based on human health and environmental risks posed by actual or potential releases to the environment, potential migration pathways, target receptors, and waste characteristics.

Two environmental indicators have been established that focus on preventing unacceptable exposure to humans and preventing the continued migration of contaminated ground water. Human health indicators have been demonstrated at 37 of the 42 sites in West Virginia, and the five sites remaining are being evaluated. Similarly, ground water migration control has been demonstrated at 33 sites, with five sites being evaluated and additional information needed for four other sites.

RCRA Corrective Action sites in West Virginia General locations

Landfill Closure Assistance Program

The "Solid Waste Landfill Closure Assistance Program," Chapter 22, Article 16 (LCAP Act) was adopted to provide an assistance program to landfill permittees to facilitate closure of substandard landfills in a timely and environmentally sound manner. Landfill permittees that stopped receiving waste before June 2, 1996 must close their facility in accordance with the terms and conditions of their solid waste permit, order, and/or the laws, rules, and regulations in place on May 1, 1990. The assistance provided

Green shaded facilities have been capped as of Dec. 31, 2013 and are in 'Post-closure monitoring and maintenance'

Group 1 *	Group 2	Group 3 *	Group 4 ○	Group 5 □
Marion County ⬡ 2014		Clarksburg ⬡ ◇ 2015	ERO	Berkeley County ◇
This landfill scheduled for bid in FY2014		Kingwood ◇ 2015	Fayette County ⬡	Big Bear Lake**
		South Charleston ⬡ ◇ 2014	Kanawha Western ⬡	Buckhannon ◇
		Wheeling/North Park ⬡ ◇ 2016	Montgomery ⬡	Capon Springs & Farm
			Morgantown ⬡	Central WV Refuse
			Wyoming County ⬡	Don's Disposal ◇
				Fleming ◇
				Hampshire County ◇
				Jackson County
				Jefferson County
				McDowell County
				Midwest Disposal
				Mingo County
				Monongalia County
				Morgan County
				Moundsville
				Petersburg ◇
				Pine Creek/Omar
				Rehe/Preston

* Projected closure dates
○ Federal Subtitle D Soil Cap
□ State Regulated Cap
⬡ Facility connected to sanitary sewer
◇ Facilities have engineering contracts to design the closure of the facility.
** Big Bear Lake was removed and disposed of at the Meadowfill Landfill

Landfill Closure Assistance Program Projects Status

by DEP under LCAP, covers the costs of closure projects and may include:

- closure design including analysis of the effect of the facility on groundwater and design measures necessary to protect and monitor groundwater;
- construction of closure-related structures to provide leachate management, sediment and erosion control, gas management, groundwater monitoring, and final cover and capping to meet the Solid Waste Management Act, §22-15;
- monitoring of surface and groundwater required by the Water Pollution Control Act, §22-11 and the Solid Waste Management Act, §22-15;
- remedial actions to protect groundwater and surface water, other natural resources, and the health and safety of the citizens of West Virginia to the extent that funds are available;
- Post-closure monitoring and maintenance, which includes leachate management during the 30-year post closure monitoring period.

Twenty-eight landfills were initially accepted into the program, and two others have subsequently been added by legislation. Twenty-five facilities are in the post-closure monitoring and maintenance phase and the five remaining landfills are scheduled to be closed, with all construction projected to be completed by 2016.

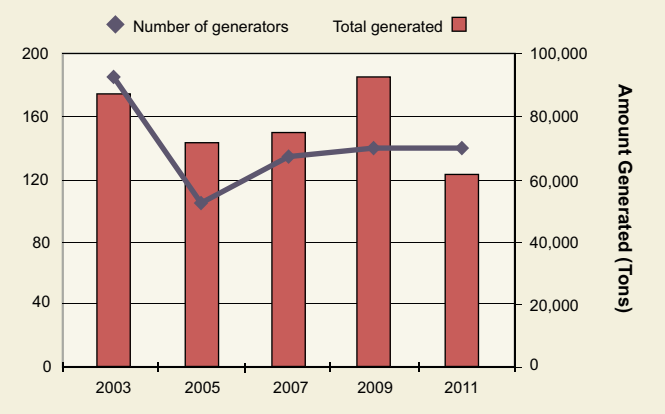
Hazardous Waste Generation

Hazardous waste has the potential to cause health and environmental threats when improperly treated, stored, transported, or disposed of. It is regulated under the Federal Resource Conservation and Recovery Act of 1976 (RCRA) and state law. Under these regulations, the wastes are to be managed safely and tracked from the time they are generated until their final disposition ("cradle to grave").

Hazardous waste is any solid waste, as defined under RCRA, which exhibits any of the "characteristics" of hazardous waste or is a "listed" waste. The wastes can be liquids, solids, contained gases, or sludges. Characteristic wastes are wastes classified as hazardous by exhibiting the characteristic of being ignitable, corrosive, reactive, or toxic. There are over 500 specific hazardous wastes identified under RCRA and termed "listed" wastes. Some examples of these wastes are discarded commercial chemical products, such as solvents, cleaning fluids and pesticides, or by-products of manufacturing and industrial processes.

Hazardous Waste Generated in WV

Large quantity generators and total tons of waste generated in the past five years



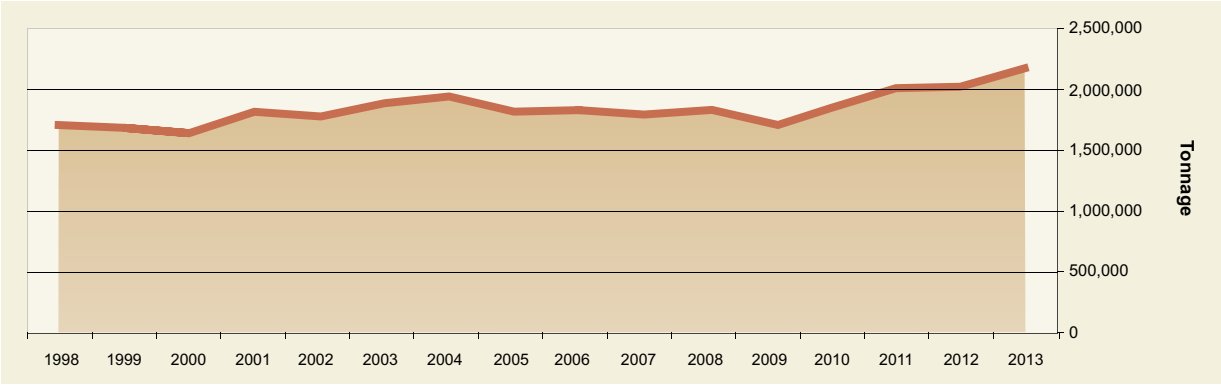
Biennially the EPA, in partnership with the states, collects and publishes information regarding the generation, management, and final disposition of hazardous wastes by large quantity generators (LQGs). Biennial hazardous waste report information is available at: *http://www.epa.gov/epawaste/inforesources/data/biennialreport/*

In 2011, West Virginia ranked 31st in the nation for quantity of hazardous waste generated. The following chart shows the top 10 quantities of hazardous waste generated in West Virginia by the industry sector during that year.

Hazardous Waste
Top Ten Quantities of Waste Generated in WV in 2011 by industry sector
Source: The National Biennial RCRA Hazardous Waste Report (based on 2011 data)

2011 Ranking	NAICS	Description	Tons Generated
1	3251	Basic Chemical Manufacturing	27,188
2	3253	Pesticide, fertilizer, Agricultural Chemical Manufacturing	11,463
3	3311	Iron and Steel Mills and Ferroalloy Manufacturing	9,272
4	3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments	2,122
5	2211	Electric Power generation, transmission and distribution	2,077
7	3314	Nonferrous Metal (except Aluminum) prod. & processing	1,429
6	3328	Coating, Engraving, Heat Treating, & Allied Activities	1,104
8	3261	Plastics Product Manufacturing	1,055
9	3262	Rubber Product Manufacturing	969
10	3311	Furniture & Cabinet Manufacturing	922
Total			**57,566**

Solid Waste Disposal Tonnage
(tons per year)
Source: Solid Waste Management Board and Department of Tax and Revenue validated receipts, reports and monthly tonnage reports submitted by commercial solid waste landfills in WV.



Solid Waste Generation

The use of materials, both raw and manufactured, leads to the generation of solid waste. The illegal disposal of solid waste creates pressure on the environment and has the potential for adverse health effects.

National data reveals that Americans continue to generate increasing amounts of municipal solid waste daily. The amount for Americans has increased from 2.7 pounds per person in 1960 to 4.4 pounds per person today. For West Virginians, that number is believed to be about four pounds per day. Municipal solid waste includes garbage, paper, litter, refuse, cans and bottles, and results from industrial, residential and commercial sources.

The volume of municipal solid waste disposed in West Virginia is more of an indicator of opportunities for reuse, recycling, materials recovery, and waste reduction than of direct stress on the environment, because properly managed municipal solid waste landfills pose little direct risk to human health and the environment.

Solid waste landfills construct approximately 17 acres of composite lined area per year to ensure the disposal needs of the state are met. For the purposes of this report, the indicator chosen to reflect the disposal of solid waste is the trend of solid waste disposed during the period from fiscal year 1992 through 2013.

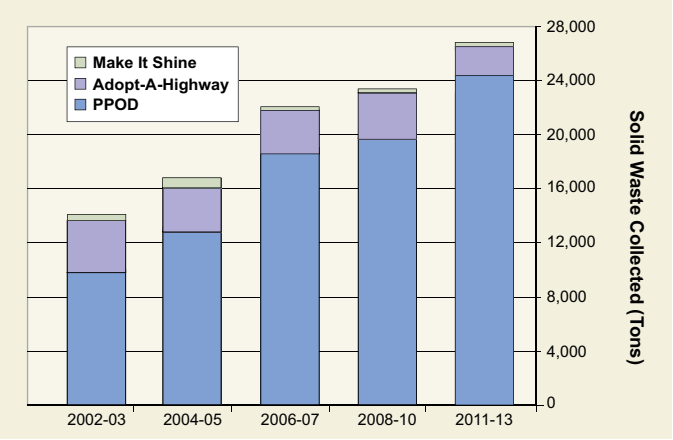
As shown on the chart, there has been only a slight increase in recent totals. This increase is partly due to the Horizontal Well Control Act, passed by the state legislature in December 2011 to better regulate the state's natural gas drilling industry. The Act requires, among other things, the disposal of drill cuttings and associated drilling waste from horizontal well development into an approved solid waste facility.

REAP

In July of 2005, the Rehabilitation Environmental Action Plan (REAP) was re-established as an arm of the DEP. Charged with the task of cleaning up the state, REAP combines existing elements of the DEP with those formally housed under the Division of Natural Resources (DNR) into a more effective and streamlined system for the direction of environmental remediation programs. Bringing all of the state's cleanup programs under one umbrella, the program provides oversight of litter removal, statewide recycling, and open dump cleanups.

Three cleanup programs exist under REAP: the Pollution Prevention Open Dump, the West Virginia Make It Shine and the Adopt-A-Highway/Adopt-A-Spot programs. For the years 2011-2013, these three programs removed 26,278 tons of solid waste, 566 tons of recyclable scrap metal, 6,080 appliances and 1,048,225 waste tires from West Virginia's roadsides, streams and public lands. The effect that these three programs have on West Virginia's environment cannot be measured by the tonnages associated with their cleanup efforts alone. Their success can also be seen in the wide variety of geographic settings that these cleanups affect. Since 2011, PPOD has eradicated 3,934 illegal dumps throughout the state. PPOD and Make It Shine have been responsible for the reclamation of 7,082 acres of our state's public lands. Volunteers of the Adopt-A-Highway/Adopt-A-Spot programs have cleaned 12,507 miles of roadway since 2011. Make It Shine and PPOD have

REAP Programs
Total Solid Waste Collected
(2002-2010)



REAP works to educate West Virginians about the merits of pollution prevention and recycling while encouraging volunteerism in cleanup efforts.

recently joined together in offering assistance to volunteer groups wishing to conduct stream cleanups. Since 2011, volunteers working for the West Virginia Clean Streams program have cleaned 676 miles of stream bank, removed 298 tons of litter and recyclables, as well as 7,921 tires from West Virginia's waterways.

Another of REAP's programs working toward the preservation of the environment is the Statewide Recycling Program. This program has four components: Recycling Assistance Grant Program, Litter Control Grant Program, Covered Electronics Grant Program, and the State Employees Office Paper Recycling Program. The Recycling Grant Program has awarded $4.5 million since 2011. During that same period, the Litter Control Grant Program issued awards totaling $177,143. The Covered Electronic Devices Program was established in 2008. The CED Program ensures that manufacturers register their brands with the state, and allows counties and municipalities to apply for grants to conduct electronic collection events. Since 2011, the CED Program has awarded $644,324. The total amount that has been awarded among the three grant programs since 2011 is $5.3 million.

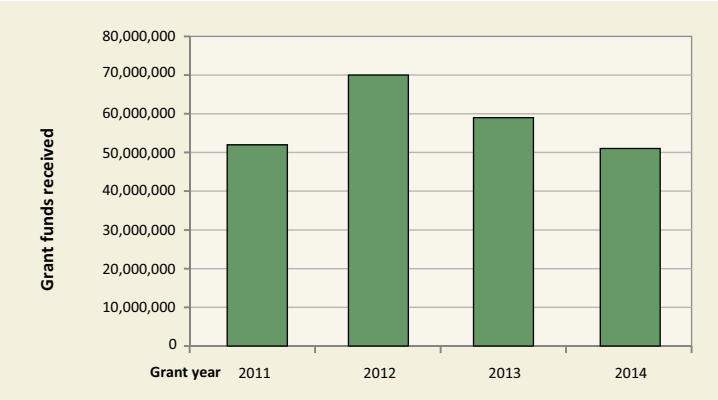
Much of the success of these cleanup programs relies on the participation of volunteers. Since 2011, 93,613 West Virginians have participated in REAP cleanup programs.

Abandoned Mine Lands

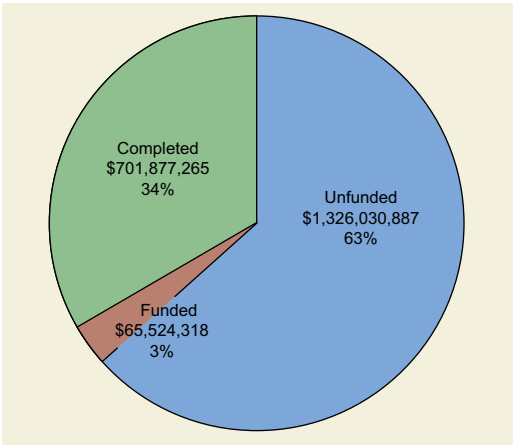
The mission of the Abandoned Mine Lands Reclamation Program is to reclaim abandoned mine land (AML) sites by abating hazards, reducing or mitigating the adverse effects of past mining (prior to 1977), and restoring adversely affected land and water to beneficial uses. The DEP's Office of Abandoned Mine Lands and Reclamation (AMLR) is successfully carrying out this mission by addressing the most serious of the health and safety issues created by these AML problems, but there are many more problems remaining that need to be addressed and ultimately abated. AMLR conducts all of the AML reclamation in West Virginia.

The AML Program experienced a decrease in grant funding in 2013 due to federally required sequestration. In the grant years between 2011 and 2013, the DEP received $52 million, $70 million and $59 million in AML grant funds, respectively. In 2014, the DEP received $51 million in AML grant funds. West Virginia is expected to receive an additional $105 million in the following three grant years from 2015 to 2017. The grant funds are distributed into four distinct program areas. Those areas are: abatement and reclamation of health and safety problems; emergency health and safety; construction of waterline extension projects; and treatment of acid mine drainage.

AML Grant Funds
Received 2011-2014



Current AML Inventory



The health and safety issues that are abated consist of dangerous highwalls, landslides, mine subsidence, drainage issues and portal closures. Under the regular construction program, high-priority, non-emergency problems caused by past mining practices are abated. The DEP has an uncompleted inventory of priority health and safety sites that exceeds $1.3 billion.

Emergency projects are health and safety projects that are abated through expedited contract procurement procedures. These projects are sudden occurrences of an AML hazard that pose an immediate threat to public health and safety.

The third area of funding involves providing clean drinking water by extending waterlines to those areas that were impacted by pre-law (prior to 1977) mining activities. Currently, the DEP has completed 40 feasibility studies making up 30 waterline extension projects which are eligible for AML funds, contingent upon approval by the Office of Surface Mining (OSM), at an AML share of nearly $110 million. A significant setback in this process occurred as a result of a feasibility oversight study conducted by OSM. OSM's feasibility oversight study indicated methods used and supporting documentation were not sufficient to fund waterline extension projects at levels indicated in the feasibility studies. Because the AML program has funded waterlines using the same basic criteria for over 20 years without indication from OSM that pro-

cedures or methods were incorrect, the results of OSM's feasibility oversight study were shocking knowing the impact this has to the citizens of West Virginia. As a result, AML staff is working with public service districts, consultants, watershed groups and citizens in an effort to provide OSM with information it indicated was lacking in the feasibility studies. The AML program is working cooperatively with OSM to ensure all proposed waterline extension projects meet current regulatory eligibility and funding requirements. Using criteria that is now required, it will not be possible to fund all 30 waterline projects at the percentage originally indicated in the feasibility studies. The amount of AML funding available for each project will be determined as OSM evaluates supporting documentation submitted by AML. Submission of supporting documentation has been prioritized by each waterline project's readiness to proceed.

The fourth area that funds are used is the treatment of acid mine drainage. The 2006 amendment to SMCRA allowed states to set aside 30 percent of eligible grant funds in an interest-bearing state account. In 2013, the state Treasurer's Office allowed for changes in this investment strategy, which will allow the AML program to increase the revenue provided by the fund. The DEP intends to set aside these funds with the intention that interest from the fund will allow for the operation and maintenance for perpetual water treatment once the fee collection ends in 2022.

Currently, AML has constructed and put into operation nine in-stream treatment dosers located in the Tygart, Blackwater and Potomac watersheds. AML and the DEP Watershed Assessment Section are jointly monitoring and evaluating the success of these treatment locations. All construction and operational costs are paid from the set aside account.

The AML grant expenditures reclaim mined lands to a more beneficial use, removes and abates health and safety hazards, extends water service to communities and restores impaired streams, providing a major contribution to an improved quality of life for the citizens of West Virginia.

Special Reclamation

Mandated by SMCRA, the Office of Special Reclamation (OSR) is charged with protecting public health, safety and property by reclaiming land and treating water on all bond-forfeited coal mining permits in West Virginia.

Bond-forfeited coal mine permits in West Virginia may be comprised of any combination of dangerous highwalls, unsealed underground mine portals, shafts, boreholes, leaking impoundments, ponds, refuse piles, abandoned preparation plants and other infrastructure, debris, extensive unvegetated areas, and acid mine drainage (AMD). OSR eliminates these hazards.

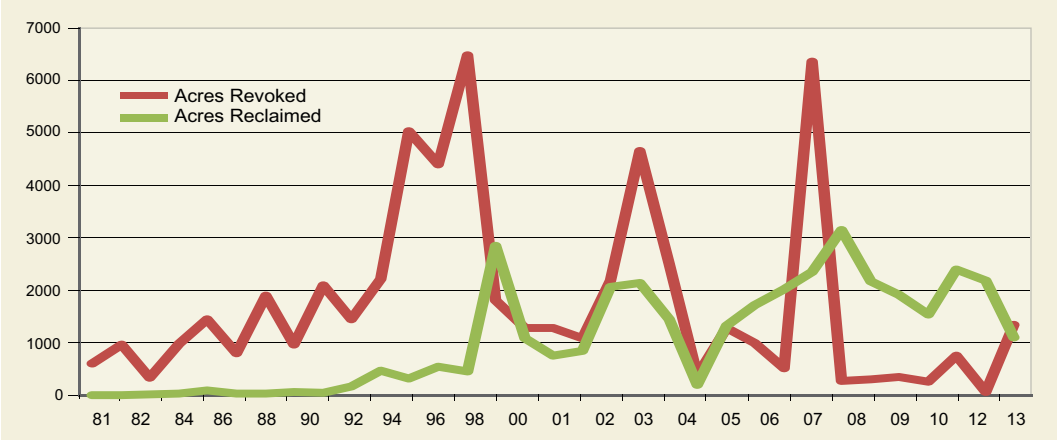
Funding for the program comes from bond-forfeitures, civil penalties and the Special Reclamation Tax on mined coal.

Prior to passage of Senate Bill 5003 in 2001, OSR was hindered in discharging its duties fully due to limited funding. Since then, the increase in the Special Reclamation Tax has allowed OSR to increase staff, equipment and funding to reclaim land and treat water on bond-forfeited permits in 46 coal-mining counties in West Virginia. Since its inception, OSR has reclaimed over 50,000 acres on 1,791 permits and as of Dec. 31, 2013, treats water on 141 permits.

OSM is tasked with oversight of the West Virginia AML program. Oversight includes providing guidance and informing the AML program when actions need corrected.

571 Revoked Permits	
467	Reclaimed Projects
45	Permits in Progress
59	Permits to be Reclaimed
281 Water Treatment Permits	
141	Water Treatment Sites
89	Sites Under Construction
51	Sites to be Constructed

OSR Land and Water Treatment Progress
as of Dec. 31, 2013



OSR Acres Revoked and Reclaimed
as of Dec. 31, 2013

energy

Energy production *requires permitting by DEP to ensure environmental impacts are minimized.*

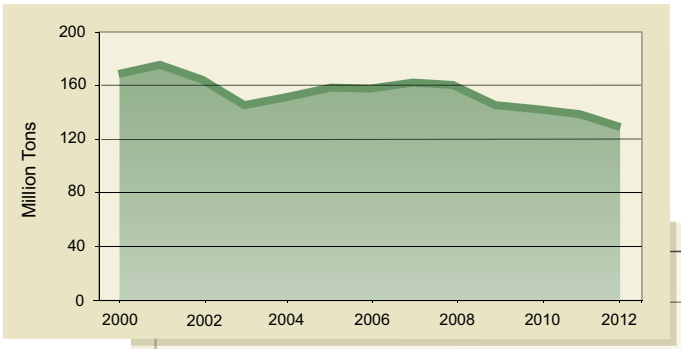
West Virginia is well known as a leading energy producer in the United States. The state's natural gas industry has skyrocketed in the past three years as gas operators target the lucrative Marcellus Shale in the north central region of West Virginia and use horizontal drilling techniques to efficiently extract the gas. In December 2011, state legislators passed the Horizontal Well Control Act, which established a new regulatory framework for horizontal well development. Since then, the DEP's Office of Oil and Gas has issued close to 1,500 permits for horizontal drilling operations. Today, there are roughly 60,000 producing horizontal and conventional gas wells in West Virginia.

In response to the state's growing natural gas industry, Brazil-based Odebrecht announced in 2013 it was exploring the possibility of developing a massive petrochemical complex in Wood County, which would include an ethane cracker plant, three polyethylene plants and create hundreds of jobs. Called the Appalachian Shale Cracker Enterprise or ASCENT, the project is in the early stages of planning.

While the natural gas industry in West Virginia is booming, coal production, coal prospect permits and the number of active mines in the state have all decreased over the past several years. Fluctuating market conditions for coal, as well as regulatory obstacles at the federal level and less-accessible seams, are partly to blame for the decrease.

Still, West Virginia's energy outlook remains bright and the state will continue to be a leader in energy production. The DEP stands ready and is committed to ensuring that the state's environment is protected down the road as more innovations in energy production emerge.

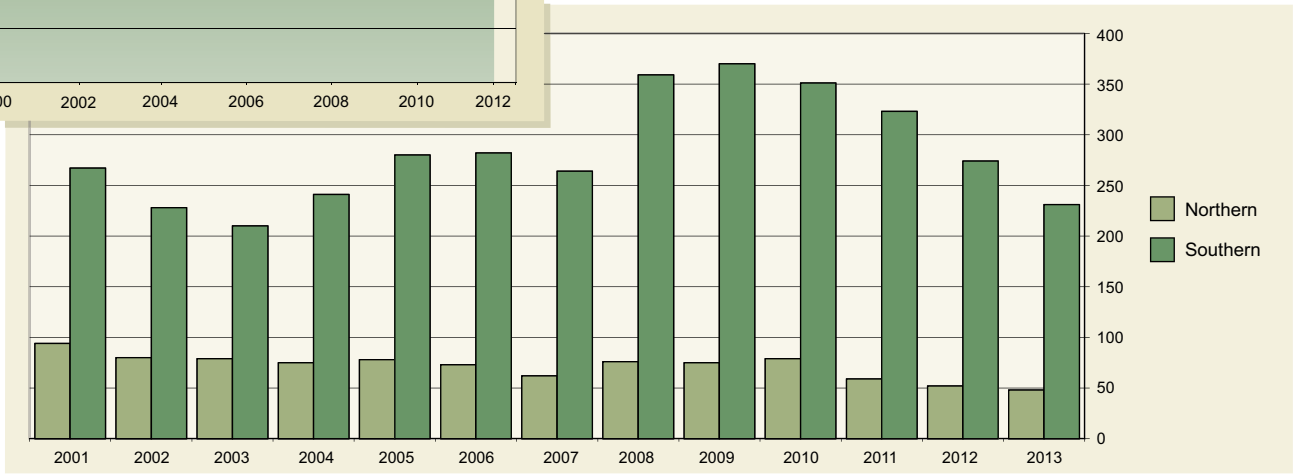
West Viginia Coal Mining Production



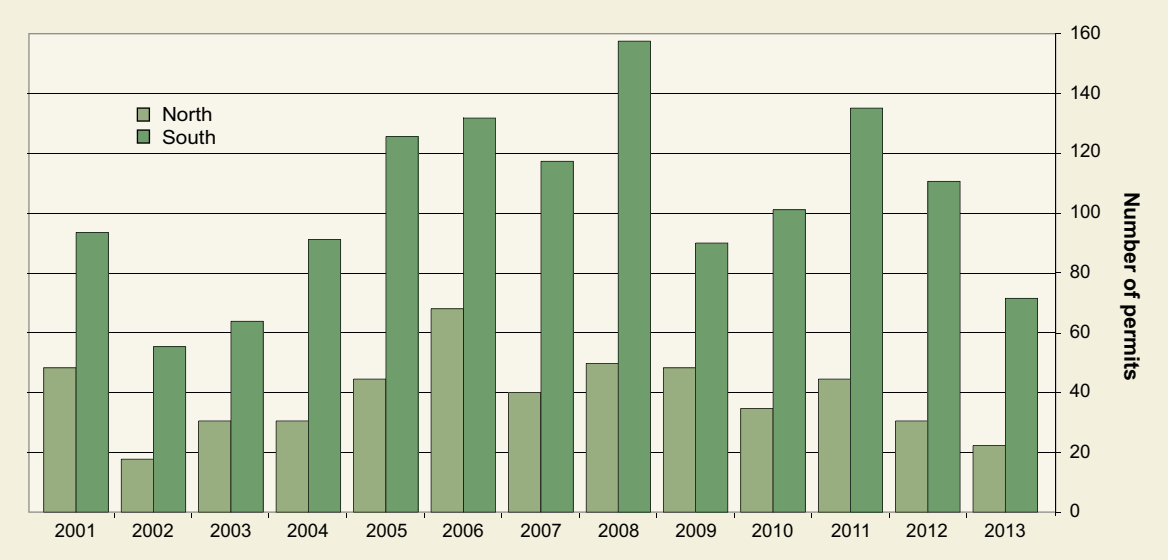
Mining

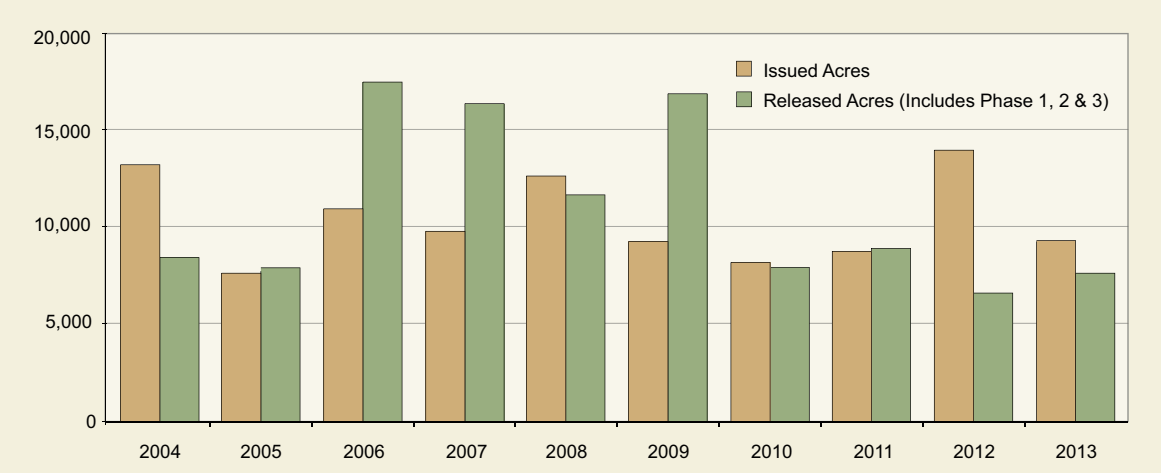
The number of active surface and underground coal mines in West Virginia is a good indicator of mining intensity in the state. The number of active mines in West Virginia has

Active Surface and Underground Coal Mines



Coal Prospect Permits Issued



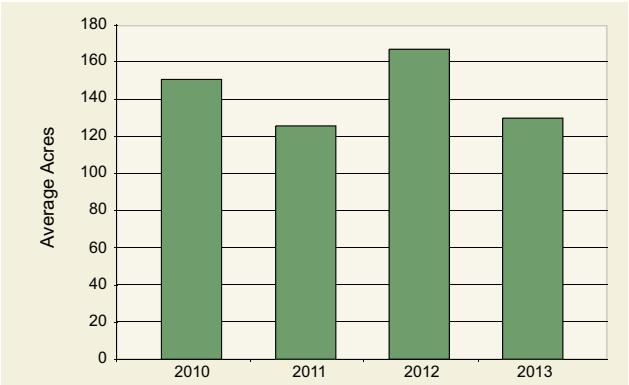


New Permit/ Amendment Acres
Issued and Released Acres

decreased since 2009 to its lowest level since 2003 in both the northern and southern sections of the state, although the rate of decline is less in the north. Coal production has decreased to its lowest point in 10 years.

Another indicator of mining's intensity is the number of permit applications submitted by the coal industry. Both applications for new permits, as well as prospect notices, were down for 2013 and even more so in the first half of 2014. See the graph above. Prospect notices for both the north and south have dropped to their lowest levels since 2002-2003 and are half of what they were in 2011. Although the number of permit applications has decreased by more than half from 2010 to 2013, the average number of acres has fluctuated by less than 40 acres.

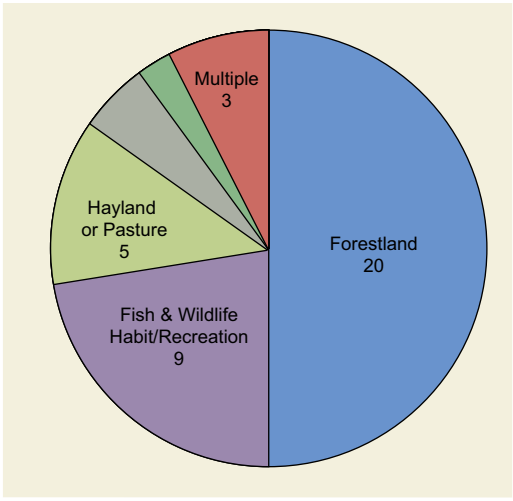
Surface Permits
Average Permit Acres



From an inspection standpoint, the DEP's Division of Mining and Reclamation conducted nearly 22,000 mining and quarry inspections on almost 2,000 open permits in 2013. Even though many of the open permits are not active, there are still requirements for inspections on these sites.

In 2011 and 2012 there was an increase in acres issued, while acres meeting bond release standards decreased. As shown in the accompanying chart above, in 2012 the acres permitted were nearly double the acres released.

2013 Released Permits with post-mining land use
Total: 40



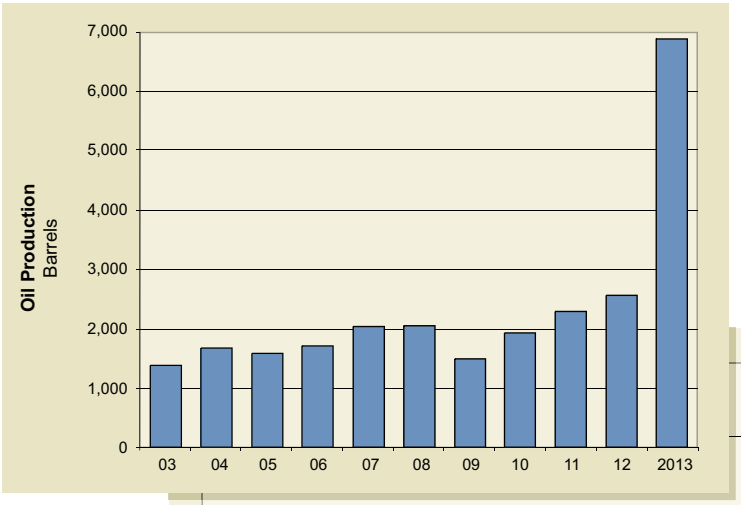
West Virginia coal mining permits reclaimed and released are being restored to productive post-mining land uses compatible with surrounding environmental conditions. In 2013, half of the 40 released permits were returned to forestland.

Oil and Gas

Oil and natural gas development has transformed mainly into activities involving horizontal drilling, particularly in the Marcellus Shale. While some "conventional'' vertical development continues, most of the activity and production centers around horizontal drilling and consequently operations involving much larger sites and operations using large volumes of water. In response, the regulatory framework and the Office of Oil and Gas itself, has transformed to address these different operational techniques.

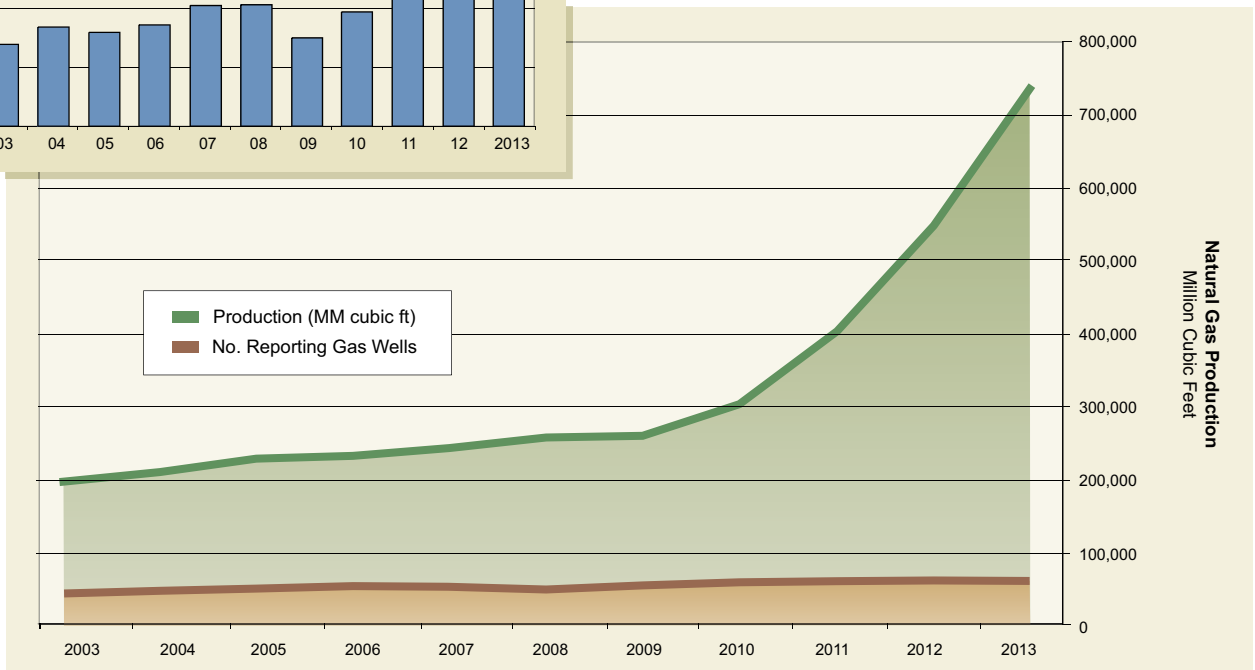
In August of 2011, the OOG promulgated an emergency rule for horizontal drilling and then in December of the same year, the West Virginia Legislature passed the Horizontal Well Act during a special session called by the governor. The Horizontal Well Act established a regulatory framework for the drilling of horizontal wells, predicated on the amount of surface disturbance and the amount of water used in the operations. The vast majority of permits for new wells are currently being permitted under this law.

The new legislation established requirements resulting in more technical and complex permit applications which, in turn, have led to longer review timeframes. Further, the additional requirements led to the need for additional staff. This need was addressed in the Horizontal Well Act, which created a funding mechanism for hiring new staff, as well as the ability to fill existing vacancies through an increase in permit fees. OOG currently has 47 full-time employees, compared to approximately 27 when the Horizontal Well Act was passed.



West Virginia Oil Production

Natural Gas Production in West Viginia



Abandoned Wells

West Virginia law defines an abandoned well as any well that is completed as a dry hole or that is not in use for a period of 12 consecutive months. Any well identified as abandoned is required to be plugged by the operator unless the operator demonstrates that the well has a bona fide future use. Due in part to the long well-drilling history and changing requirements over that period of time, West Virginia currently has approximately 11,930 permitted wells that fall into the abandoned category. Through additional staffing, over the past year, the OOG has been able to provide a greater focus with the industry on the abandoned well matter through increased emphasis on production reporting, bona fide future use establishment and well plugging schedules.

West Virginia currently has approximately 11,930 permitted wells that fall into the abandoned category.

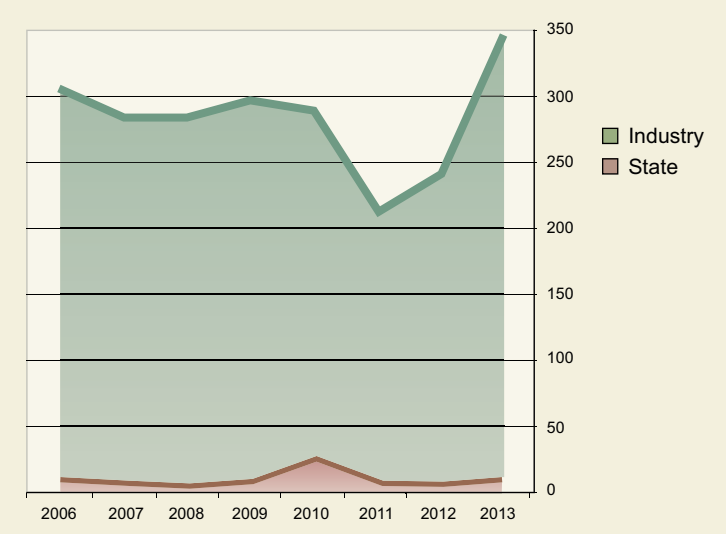
While many abandoned wells may actually pose little environmental threat, others are a concern. These wells may be leaking crude oil or salt water at the surface, potentially polluting nearby streams. Natural gas may also be leaking into the atmosphere. The sites themselves may also create problems due to a lack of proper reclamation, creating sediment and erosion control problems that consequently affect the state's surface waters.

Perhaps the greatest concern is the uncertainty of what may be occurring below the surface. Unplugged wells or improperly plugged wells can lead to groundwater contamination with crude oil, salt water and natural gas. The problem may go unnoticed for a period of time, resulting in potentially more damage to groundwater or hydrocarbon-bearing zones.

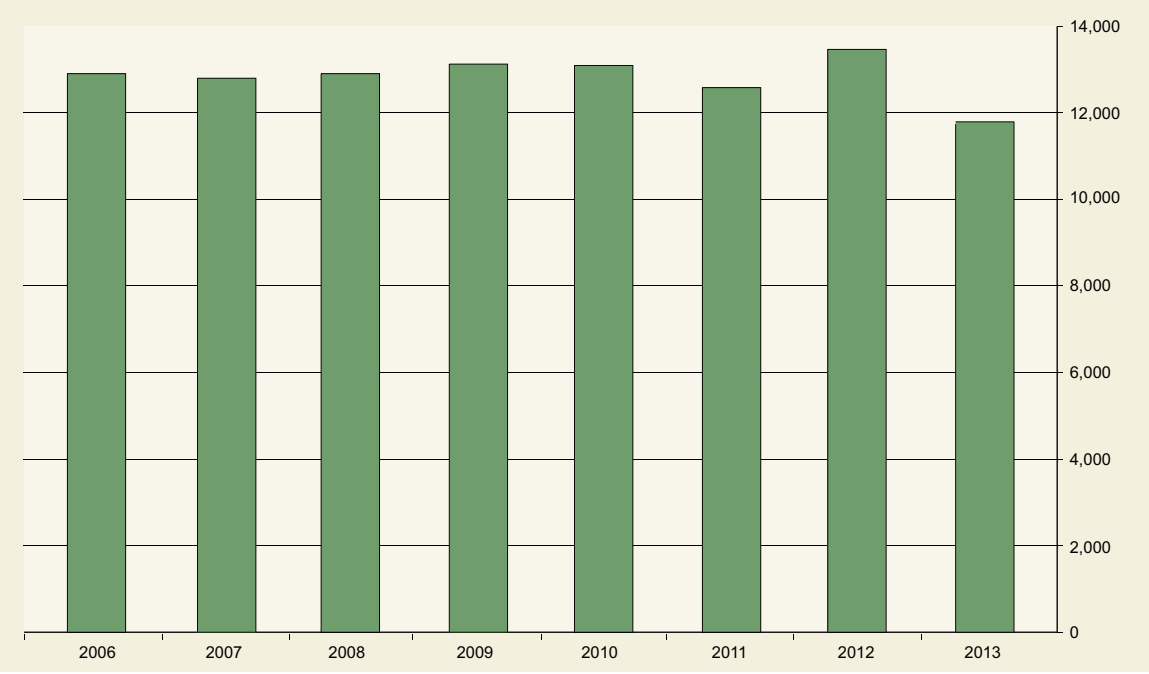
To help address problems associated with abandoned wells, the OOG administers the Oil and Gas Reclamation Fund. While the fund is limited, the resources are used to respond to the greatest environmental or safety threats. Over the past several years, the DEP has been successful in obtaining federal funding to address some of the problems associated with crude oil contamination of surface waters from abandoned wells. During the past 10 years, the OOG has plugged or reclaimed 184 wells and well sites at a cost of approximately $6 million.

During the past 10 years, the OOG has plugged or reclaimed 184 wells and well sites at a cost of approximately $6 million.

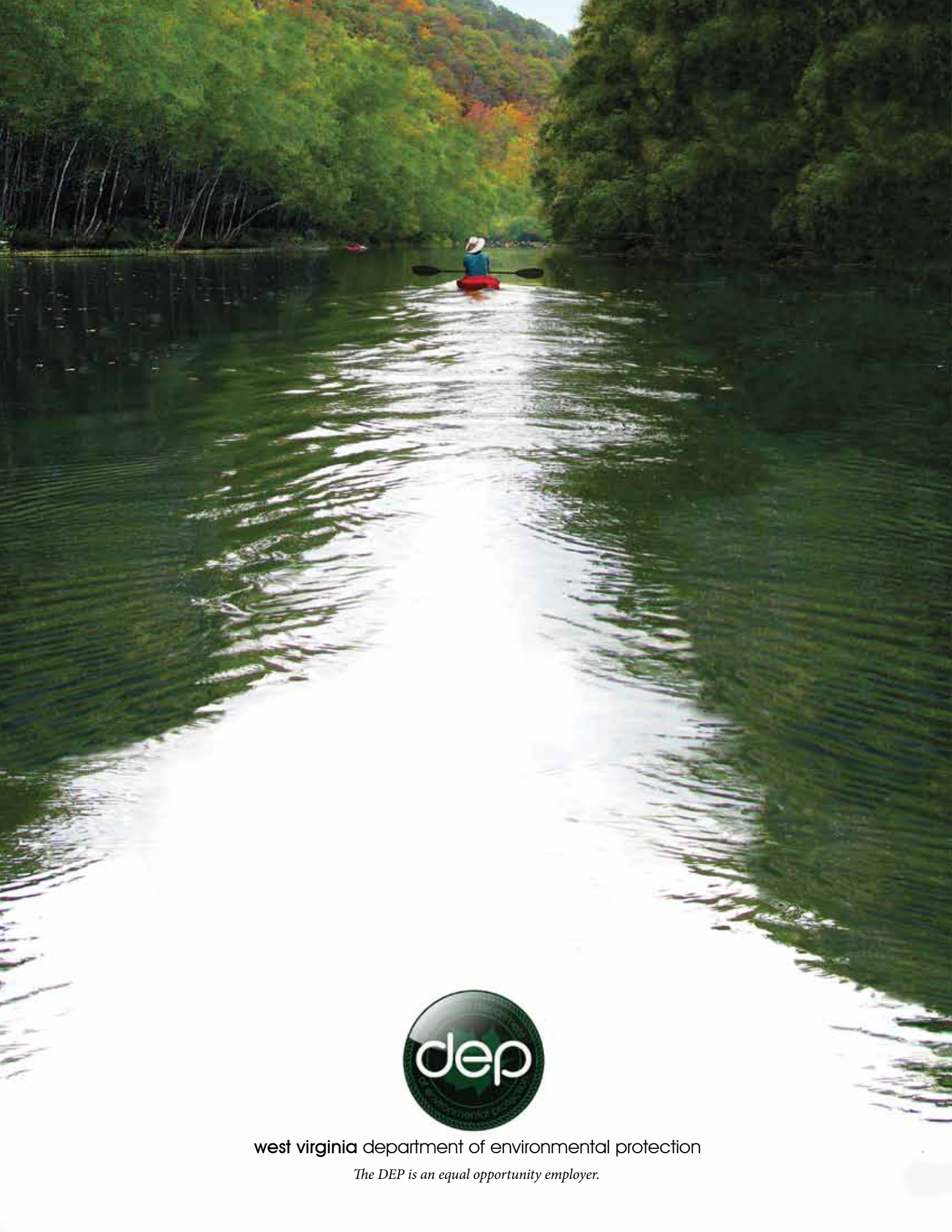
Wells Plugged



Abandoned Wells Inventory



index of exhibits



west virginia department of environmental protection

The DEP is an equal opportunity employer.