Kentucky Division for Air Quality
Fiscal Year 2011 Annual Report

Commonwealth of Kentucky
Energy and Environment Cabinet
Department for Environmental Protection
Division for Air Quality
air.ky.gov

FROM THE DIRECTOR

It is my pleasure to share with you the Kentucky Division for Air Quality's annual report for fiscal year 2011. This report identifies the division's goals and achievements over the past year, summarizes the current state of Kentucky's air quality, and highlights challenges that the agency will face in the next year and beyond.

Kentucky's air quality has improved significantly in the last four decades since the Clean Air Act was passed. In fact, for the first time since the 1997 National Ambient Air Quality Standards for ozone and fine particulate were finalized, all of Kentucky's counties are showing compliance with those standards. Interestingly, as air quality has improved, the economy has more than tripled – proof that environmental protection and economic development are not mutually exclusive. It's a remarkable achievement, since economic and population growth results in additional pollution sources from expanded industry, more traffic, and greater energy demand in a state that obtains 96% of its electricity from coal.

The United States Environmental Protection Agency reviews and revises the health-based National Ambient Air Quality Standards as necessary to reflect increased scientific understanding about the impacts of air quality on human health and the environment. Even though all of Kentucky's counties were in attainment for these standards in FY2011, stricter standards are on the horizon. This means that some counties that have never been charged with poor air quality may soon need to look for innovative ways to reduce air pollution locally.

Air quality isn't just an industrial issue. Each of us has an important role to play in keeping our air clean. From driving a car to turning on the lights to mowing the lawn, so much of what we do in our daily lives impacts air quality. All across Kentucky, people are making simple choices that make a difference – and so can you.

- Turn off the lights when you leave the room
- Reduce unnecessary idling in your vehicle
- Install weather stripping around doors and windows
- Launder in cold water
- Purchase Energy STAR appliances

Actions like these save you money *and* protect our resources for future generations. Remember, it all adds up to cleaner air!

Sincerely,

John S. Lyons, Director

Kentucky Division for Air Quality
Annual Report
Fiscal Year 2011

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EXECUTIVE SUMMARY

The mission of the Division for Air Quality (DAQ) is to protect human health and the environment by achieving and maintaining acceptable air quality through:

- *Operation of a comprehensive air monitoring network;*
- *Creating effective partnerships with air pollution sources and the public;*
- *Timely dissemination of accurate and useful information;*
- *The judicious use of program resources; and*
- *Maintenance of a reasonable and effective compliance assurance program.*

The third largest division in the Department for Environmental Protection with 163 staff positions, DAQ oversees a diverse air quality program that encompasses monitoring, regulation development, compliance with federal air quality standards, permitting regulated facilities and environmental education.

Selected achievements and challenges for Fiscal Year 2011

- A broad assessment of air quality over time (1980-2009) for six federally regulated air pollutants shows a trend of reduced air pollution (Figure 1). Air quality continues to improve statewide, as evidenced by the entire state being designated by the United States Environmental Protection Agency (EPA) as meeting the 1997 8-hour ozone standard for ground-level ozone pollution. Better quality air in Kentucky is due to a combination of regulatory and voluntary programs put in place by local, state, and federal governments.

- These pollution reductions, while wonderful news for public health, do have fiscal impacts. In calendar year 2009, emissions of sulfur dioxide and nitrogen oxides were reduced by 27,000 billable tons, in large part due to controls placed on power plants. This drop in emissions reduced the amount of Title V fees the agency expected to collect for its FY2011 budget, and resulted in an approximately $1.1 million shortfall.

Environmental Education

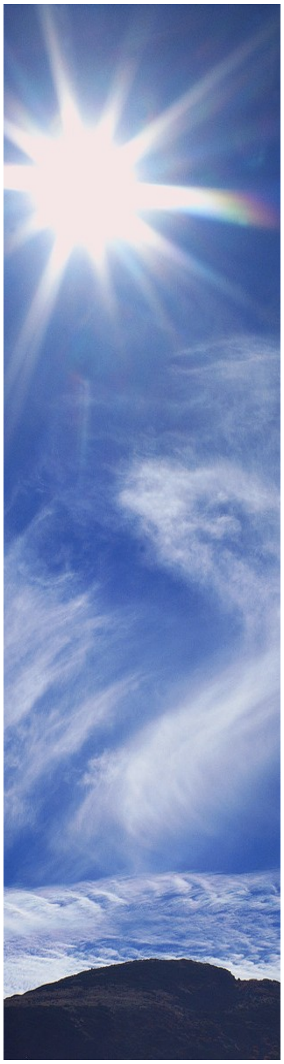
DAQ's environmental education (EE) program has reached thousands of students, teachers, and citizens across the Commonwealth through a combination of presentations, exhibitions, and workshops, along with serving in a number of collaborative groups that work to improve air quality.

"This has been an historic year for air quality. Greenhouse gas emissions from automobiles and industry became regulated for the first time in 2011, and several other EPA rules were finalized. These new rules – and those to follow in the coming year – will have significant impacts on staff time and the agency's budget.

2011 was also an important year for Kentucky's air quality. For the first time since 1997, all of Kentucky's air monitors met the National Ambient Air Quality Standards for the six criteria pollutants in 2011. Despite this good news, Kentucky will undoubtedly face new challenges in the years ahead as health-based air quality standards become more stringent. As a result, counties may need to look for innovative ways to reduce air pollution on a local level.

The Division for Air Quality staff is happy to work with counties to help them find strategies to reduce local air emissions. Examples of voluntary reduction strategies include: strengthening of bicycle, pedestrian and public transit networks; increasing community recycling infrastructure and passing local burn bans; utilizing biofuels; and installing solar panels or geothermal systems. In addition to offering technical support, the Division also has a free education and outreach program available to all audiences to help raise awareness of and participation in these kinds of programs."

John S. Lyons,
DAQ Director



- Environmental education staff made direct contact with nearly 5000 Kentuckians in FY 2011, educating about a variety of air quality topics including open burning, air quality and health, and energy conservation.

- The EE program partnered with several agencies to offer professional development workshops for teachers and school administrators. Partnering agencies included the EPA, Kentucky Environmental Education Council, Kentucky Association for Environmental Education, KY Pollution Prevention Center, Toyota, and 4-H.

Field Operations
The Field Operation Branch (FOB) continues to respond to the needs of the public and regulated community by investigating complaints and routinely inspecting facilities via the division's network of eight regional offices.

- The total number of inspections in 2010 (3795) were comparable to the number of inspections conducted in 2009 (3734.)

- FOB has managed to retain a very high percentage of employees over the last year and thorough on-the-job training and completion of technical training courses have significantly improved their skill sets.

Permit Review
One of the biggest challenges for the Permit Review Branch is to issue permits within the regulatory time frames set by state regulations and the EPA which incorporate increasingly complex regulations.

- The Permit Review Branch (PRB) has essentially eliminated the long-standing permit back log, dropping the number of applications that went beyond allotted Regulatory Time Frames from a high of 524 in June 2006, to 24 at the close of FY 2011.

Program Planning and Administration
The Program Planning and Administration Branch (PPAB) helped several counties to attain the National Ambient Air Quality Standards established in the Clean Air Act, while simultaneously preparing for more stringent standards that may impact the ability of several counties to maintain compliance.

- On August 5, 2010, the EPA finalized the redesignation of Boone, Kenton, and Campbell counties as meeting the 1997 8-hour ozone standard. As a result, for the first time in 14 years all counties in Kentucky were in attainment for the 1997 8-hour ozone standard.

Technical Services
The Technical Services Branch (TSB) continues to successfully operate a network of 113 ambient air quality monitors and 13 meteorological data towers, report to the Air Quality Index, observe compliance demonstrations at permitted facilities, and collaborate with the EPA and the Program Planning Branch on exceptional event data.

- In FY 2011, the branch completed several important documents, including the 2010 Ambient Air Monitoring Network Plan, as well as eight new or revised Standard Operating Procedures.

- In September 2010, the TSB hosted a three-day Ambient Air Monitoring workshop. The training was attended by all state personnel involved with the ambient air monitoring network as well as representatives from the EPA, National Park Service, and local industry.

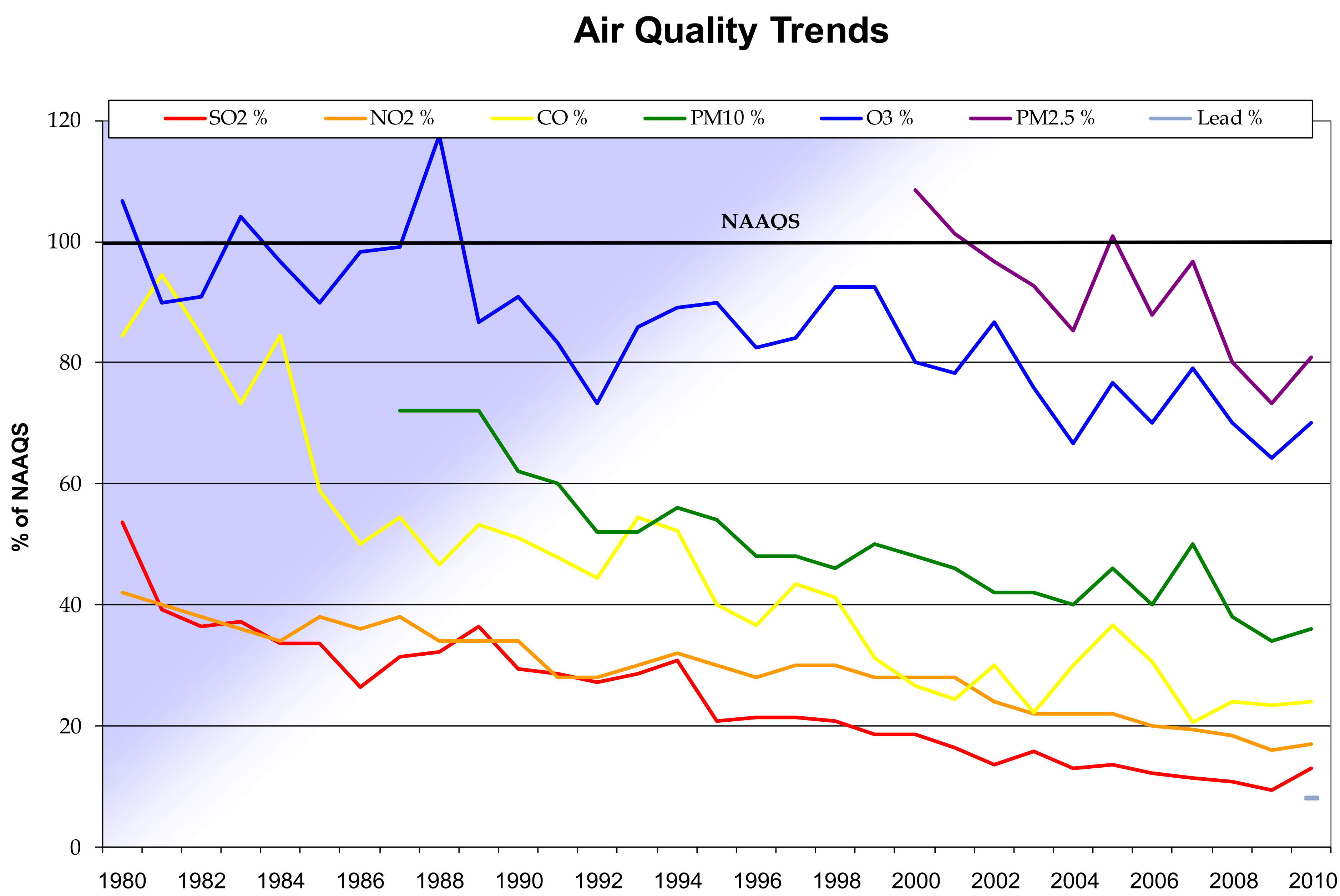


Figure 1: Air Quality Trends from 1980-2009. This chart shows trends in individual pollution levels over time. While individual pollutants may spike in certain years, overall the trend shows a decline in pollution levels. The pollutants are shown in terms of percentage of the National Ambient Air Quality Standard (NAAQS) because the different pollutants are measured in different scales, which makes direct comparison difficult. For a key to pollution abbreviations, see the Glossary of Abbreviations on page 106.

INTRODUCTION

The Division for Air Quality is one of six divisions in the Department for Environmental Protection, which is housed in the Energy and Environment Cabinet. The cabinet has developed a set of objectives to be implemented by each department in Fiscal Year 2011 (FY 2011). The objectives and tactics relevant to DAQ are included in this section.

Creating effective partnerships with air pollution sources and the public enables DAQ to carry out its goal of protecting human health and the environment by achieving and maintaining acceptable air quality. DAQ strives to assist Kentucky's citizens and businesses in a satisfactory manner by responding to complaints, requests, and permit actions quickly and thoroughly. In addition to serving individuals and businesses, the division works to ensure that the federal Clean Air Act is met by working with county and city governments to ensure local compliance with (attainment of) the National Ambient Air Quality Standards (NAAQS), which are set by the EPA.

Cabinet Objective 1.0: Eliminate DAQ permit backlog.

In order to better accomplish this objective, the Division for Air Quality has established the following tactics and measures to help us track our progress:

Tactic 1.1: Continue execution of the permit backlog reduction plan originally implemented on July 15, 2006.

Measures for Permit Backlog Reduction:

- The total number of permits pending
- The total number of permits pending that exceed regulatory time frames
- The percentage of permit reviews completed within regulatory time frames
- The percentage of permit reviews completed that exceed regulatory time frames

Cabinet Objective 2.0: Protect and enhance Kentucky's air quality.

Originally operating out of the state health department, the Kentucky Air Pollution Control Commission was the state's first air pollution control program, in operation as early as the 1940s. Kentucky's environmental cabinet was first formed in the early 1970s, in part due to national legislation which brought the Environmental Protection Agency (and the Clean Air Act) into being. Today, as in its beginning, air pollution control is divided among a hierarchy of state, federal, and local programs.

Federal Programs

The Clean Air Act (CAA) authorizes two permitting programs at the federal level. The New Source Review (NSR) program has been around since 1975 and requires extensive review of applications for major new or modified air contaminant sources prior to issuance of construction permits. Title V of the 1990 CAA Amendments authorized for the first time a federally enforceable operating permit program.

Local Authority

KRS 224 recognizes the right of counties to develop their own air pollution control districts, if they wish. Jefferson County (Louisville Metro Air Pollution Control District) has maintained a local air pollution control program since the late 1940s, while activities in the rest of Kentucky counties are covered by DAQ. The Air Pollution Control District may choose to make subtle changes or be more stringent than state and federal regulations, but it must be at least as stringent as the state and federal programs.

The division has established a number of tactics and measures to meet this second objective:
Tactic 2.1: Continue implementation of the air toxics program to evaluate and address any risks to public health associated with hazardous and toxic air pollutant emissions.

Measures for hazardous air pollutant reductions:
- The total number of air toxics assessments reviewed and/or performed
- The total number of hazardous air pollutant related complaint investigations
- The total tons of hazardous air pollutants reduced

Tactic 2.2: Implement measures contained in the June 2008 annual fine particle attainment demonstration State Implementation Plan (SIP).

Measure for demonstrating attainment of the annual fine particle standard:
- The number of counties remaining in nonattainment

Tactic 2.3: Continue implementation of federal programs and requirements contained in the 1997 8-hour ozone attainment demonstration SIP, submitted to the EPA in December 2007.

Measure for designation of the 1997 8-hour ozone standard:
- The number of counties remaining in nonattainment

Tactic 2.4: Continue implementation of federal programs and requirements contained in the December 2007 Regional Haze SIP.

Measure for implementation of the Regional Haze State Implementation Plan:
- Improved visibility at Class I areas, including Mammoth Cave National Park

Tactic 2.5: Submit recommendations to EPA by June 2011, for any areas of the state that are violating the 2010 SO_2 standard which was finalized June 2010.

Measure for recommendations for SO_2 nonattainment:
- The number of counties in non-attainment

Tactic 2.6: Determine mercury deposition and impacts resulting from emissions of mercury by Kentucky sources.

Measure for reducing emissions of mercury from stationary sources:
- The number of streams with fish consumption advisories

Tactic 2.7: Track EPA's development and implementation of their Greenhouse Gas Reporting Rule and determine what requirements may be applicable to Kentucky.

Measure for reducing greenhouse gas emissions from various Kentucky sectors:
- Total tons of greenhouse gas emissions from various Kentucky sectors

Tactic 2.8: Operate an extensive, statewide ambient air monitoring network in order to ascertain the status of Kentucky's ambient air quality.

Measures for determining the status of Kentucky's ambient air quality:

- The number of air monitors in network based on population estimates
- The number of locations selected to represent population exposure
- The number of locations selected to represent background concentration levels
- Number of locations selected to represent regional transport of ambient air pollution
- Number of monitors and locations to represent source impacts
- Hours of continuous ambient air monitoring data collected
- Number of particulate matter, lead, and air toxics samples collected
- Concentrations of pollutants for which national ambient air quality standards have been established
- Concentrations of pollutants for which health-based risk standards have been determined

Tactic 2.9: Conduct quality measurement checks and data quality assessments on the ambient air monitoring network in order to ensure data accuracy and integrity.

Measures for assessing data accuracy and integrity:

- Number of complete and current Quality Assurance Project Plans
- Number of complete and current Standard Operating Procedures
- Percentage of valid, quality-assured continuous ambient air monitoring data collected
- Percentage of valid, quality-assured particulate matter, lead, and air toxics samples collected
- Number of quality control checks performed on ambient air monitors
- Number of ambient air monitoring performance evaluations conducted

Tactic 2.10: Assure compliance with air quality regulations and standards.

Measures for compliance with air quality regulations and standards:

- Number of major stationary source inspections conducted
- Number of minor stationary source inspections conducted
- Number of routine (non-complaint) asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP) and Asbestos Hazard Emergency Response Act (AHERA) inspections conducted
- Number of NESHAP and AHERA complaint investigations conducted
- Number of asbestos NESHAP notification investigations for existing Agency Interests
- Number of asbestos NESHAP notification investigations for non-Agency Interests
- Number of routine non-asbestos complaint investigations conducted
- Compliance rate of stationary source inspections
- Compliance rate of all incident investigations
- Compliance rate with 401 KAR 63:005 - open burning, 63:010 - fugitive emissions, and 401 KAR 53:010 - odor
- Compliance rate of NESHAP and AHERA-related inspections and investigations

Regulating Greenhouse Gases: A Summary of Federal Actions to Date

January 2011 marked the first time in history that greenhouse gases (GHGs) became regulated pollutants under the Clean Air Act (CAA). GHGs are gases that have the ability to trap heat in the atmosphere. Without greenhouse gases, the earth would be a spinning ball of ice. With a very thick layer of greenhouse gases, the earth would have a very hot climate, like Venus. While a number of gases have heat-trapping potential, six key gases, including carbon dioxide, are considered to be well-mixed in the atmosphere and are the focus of climate science. Thus, greenhouse gases have been targeted for reductions by the federal Environmental Protection Agency (EPA) and other entities as one strategy to combat global climate change.

Greenhouse gases covered by Environmental Protection Agency rules are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Hydrofluorocarbons (HFC)
- Perfluorochemicals (PFC)
- Sulfur Hexafluoride (SF_6)

In light of Congress's inability to pass comprehensive climate change legislation, a series of recent and pending EPA rules have become the primary vehicle for regulation of greenhouse gas emissions. With the Light Duty Rule and Tailoring Rule going into effect on January 2, 2011, GHG permitting became a requirement for Prevention of Significant Deterioration (PSD) and Title V air permits. Meanwhile, a series of legal and legislative measures continued to challenge the EPA's right to regulate GHGs under the Clean Air Act. This section summarizes federal actions chronologically through June 2011 that relate to the regulation of greenhouse gases.

April 2007: Massachusetts v. EPA

This case grew out of EPA's back and forth stance on greenhouse gas regulation. Under the Clinton administration, EPA had determined that it *does* have the authority to regulate GHGs under the Clean Air Act. But this decision was reversed by the Bush-era EPA, which held that authority for regulating GHGs should come from Congress, not the Clean Air Act. In 2003, EPA denied a petition to set limits on GHG emissions from new motor vehicles. Petitioners responded by filing a lawsuit against EPA for failing to regulate GHG emissions, and ultimately the case made its way to the Supreme Court.

Known as Massachusetts v. EPA, the lawsuit was led by coalition of 12 states along with several cities and non-governmental agencies. The case revolved around the meaning of the Clean Air Act and its definition of "air pollutant". Are GHGs pollutants as defined in the Clean Air Act? In a 5-4 decision, the Supreme Court decided *yes*.

On April 2, 2007 the Supreme Court found that greenhouse gases fit well within the CAA's definition of "air pollutant". Therefore, EPA does have the authority to regulate GHG emissions from new motor vehicles. The Act defines "air pollutant" as "any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive . . . substance or matter which is emitted into or otherwise enters the ambient air". The Court held that EPA must justify its refusal to regulate greenhouse gases by determining whether these pollutants endanger public health or welfare.

December 2008: The "Johnson Memo"

EPA issued this Bush-era memorandum to clarify its position that carbon dioxide (CO_2) and other greenhouse gases were not considered pollutants "subject to regulation" under the Clean Air Act. In the memo, former EPA Administrator Stephen Johnson defined a "regulated pollutant" as one that is "subject to either a provision in the CAA or regulation adopted by EPA under the CAA that requires actual control of emissions of that pollutant". Because CO_2 and other greenhouse gases had no specific limits named in the Clean Air Act, the memo said, GHGs are not regulated pollutants.

Environmental groups mounted numerous legal challenges to this interpretation, arguing that if GHGs are considered pollutants under the Clean Air Act they therefore must be considered subject to regulation under the air permitting program. The Obama Administration EPA responded by reconsidering the Johnson Memo in 2009-2010, essentially agreeing with its basic premise that regulated pollutants are those whose emissions are specifically limited under the CAA or in regulation adopted by EPA under the CAA.

In the Reconsideration, EPA Administrator Lisa Jackson acknowledged the anticipated regulation of GHG emissions from new vehicles under Title II of the CAA, which was already in the works. Jackson noted that air permitting requirements for greenhouse gases would apply only when a regulatory requirement to control emissions of GHGs takes effect.

September 2009: Mandatory Reporting Rule

The Mandatory Reporting Rule does not regulate emissions of greenhouse gases, but rather it requires that entities emitting over 25,000 metric tons per year of carbon dioxide equivalent ($mtCO_2e$) must report those emissions to the federal government.

There are six greenhouse gases covered by the rule, and all have different levels of heat-trapping potential and life span. Carbon dioxide equivalency (CO_{2e}) provides a unit of common measure for these different gases. This rule allows the EPA to begin gathering data on the quantity of emissions generated by many sectors of the U.S. economy. Reporters submit data directly to the EPA; the state is not involved in collecting reports or enforcing the rule. Entities covered under the rule – primarily fossil fuel suppliers, industrial gas suppliers, manufacturers of vehicles and engines outside of the light-duty sector, and certain large industrial facilities – were required to begin collecting data in January of 2010, and to submit their first report in March of 2011. The rule was made final on September 22, 2009 (*74 FR 56259*).

Although the state is not required to report on behalf of facilities via this rule, the Emissions Inventory section has begun collecting GHG data when available through existing AP42 emission factors, which are the numbers that industry and air quality agencies use to calculate emission rates in cases where other data are not available. The data was collected for carbon dioxide (113,373,350 tons annual emissions reported), methane (39,205 tons annual emissions reported), and nitrous oxide (4,305 tons annual emissions reported). In sum, there were 115,531,148 metric tons of CO_{2e} reported in calendar year 2010.

December 2009: The "Endangerment" and "Cause or Contribute" Findings

In response to the Supreme Court's ruling in *Massachusetts v. EPA,* EPA conducted a 40-month review of the scientific literature to determine whether GHG emissions from new vehicles cause or contribute to air pollution which could endanger public health and welfare, or whether the science is too uncertain to make a reasoned decision. In its review, EPA examined the observed and projected effects of greenhouse gases in the atmosphere, their effect on climate, and the public health and welfare risks and impacts associated with climate change. The investigation resulted in two distinct findings:

- *The Endangerment Finding* states that the mix of atmospheric concentrations of six key greenhouse gases threatens both the public health and the public welfare of current and future generations.
- *The Cause or Contribute Finding* says that the combined greenhouse gas emissions from new motor vehicles and motor vehicle engines contribute to the atmospheric concentrations of the six greenhouse gases and therefore to climate change.

Finding that greenhouse gases threaten public health and welfare required EPA to take action. While the findings did not, in and of themselves, call for regulation, they did pave the way for it.

July 2010: The Light Duty Vehicle Rule

On July 6, 2010, the "Light Duty Vehicle Rule" established the nation's first standard for greenhouse gas emissions from light-duty or passenger vehicles. Focusing on carbon dioxide, the primary GHG emitted in tailpipe exhaust, the rule set a carbon dioxide limit of 250 grams of CO_2 per vehicle mile traveled for model year 2016 vehicles. The rule also incrementally raises the fuel economy of new vehicles to 35.5 miles per gallon by 2016. Setting these standards under section 202(a) of the Clean Air Act meant that greenhouse gases became a regulated pollutant under the CAA for the first time. With the rule scheduled to go into effect on January 2, 2011, states would soon be required to regulate GHG emissions from stationary sources as well.

December 2011: The "SIP Call"

In December 2010, EPA finalized the SIP Call Rule, which found that the laws of 13 states did not authorize them to regulate GHG emissions as would be required as of January 2, 2011. The SIP Call required those states to change their laws to authorize GHG regulation and to submit these changes as a part of a revised State Implementation Plan (SIP) to EPA for review and approval. The 13 states were Arkansas, Arizona, parts of California, Connecticut, Florida, Idaho, Kansas, Kentucky, Oregon, Nebraska, Nevada (Clark County), Texas, and Wyoming. Kentucky revised its SIP to include GHG permitting, and these revisions became effective on January 3, 2011.

January 2011: The Tailoring Rule

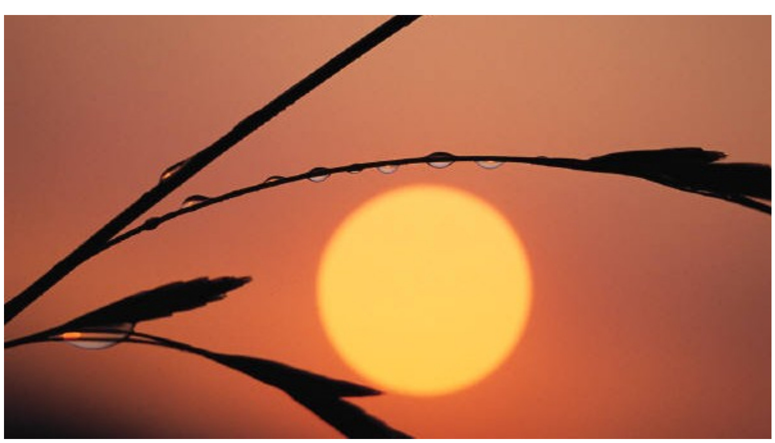
With the Light Duty Rule now in effect, GHGs officially became regulated pollutants under the Clean Air Act. The goal of the Tailoring Rule was to "tailor" the thresholds that are applicable to greenhouse gases in air quality permits for facilities that pollute. The threshold limits for the six criteria pollutants in the Clean Air Act are set at 100 or 250 tons per year per facility. Such thresholds work for pollutants like lead, sulfur dioxide, and particulate matter – but not for carbon dioxide, which is emitted in far greater quantities.

If the current emission thresholds were applied to GHGs, millions of previously unpermitted facilities would be required to obtain air quality permits, overwhelming state permitting agencies across the country. The Tailoring Rule was created to address this issue by "tailoring" the thresholds that apply to greenhouse gases – in effect, raising those limits to 75,000 and 100,000 tons per year so that only the largest emitters of GHGs would be required to obtain air permits due to their GHG emissions.

First issued in May 2010, the Tailoring Rule soon became the focus of numerous lawsuits claiming the rule was a in violation of the Clean Air Act. In June 2010, the Commonwealth of Kentucky joined with the American Chemistry Council (ACC) in filing an amicus brief in the D.C. District Court of Appeals in support of nine states and 23 industry groups challenging the Tailoring Rule. Kentucky and the ACC claimed the rule violates the Clean Air Act by ignoring the "clear intent" of Congress. By revising the emissions thresholds established under the Clean Air Act, EPA had overstepped its authority and set a precedent for other federal agencies to ignore statutory requirements, the brief said.

The first phase of the Tailoring Rule took effect January 2, 2011. According to EPA, between that date and June 30, 2013, some 550 sources would need to obtain operating permits for the first time because of their greenhouse gas emissions. An additional 900 new facilities and modifications of existing facilities per year will face GHG requirements in their construction permits. These facilities will be required to demonstrate "best available control technology" (BACT) to control their GHG emissions. With no proven technology for carbon capture and storage on the immediate horizon, EPA anticipates GHG reductions will be accomplished largely through energy efficiency improvements at those facilities.

In March of 2011 EPA proposed deferring the application of stationary source permitting requirements to CO_2 from biogenic sources for the next three years. The rule (finalized in July 2011) defers the application of both PSD and Title V permitting requirements and applies only to the emissions of CO_2 from bioenergy and other biogenic stationary sources. EPA plans to undertake a detailed examination of the science associated with biogenic CO_2 emissions from stationary sources during this three-year period.



ENVIRONMENTAL EDUCATION

The goal of environmental education (EE) is to give individuals the tools and information needed to think critically and independently about the world around them. Environmental education focuses on the interactions between society and the environment. Air quality is a fitting arena for such a focus, because so much of what people do in their daily lives impacts air quality. The division's environmental education program emphasizes experiential education, with the philosophy that the best way for students to learn is to become actively engaged in whatever it is that they seek to learn.

DAQ's EE program reaches a diverse audience across the Commonwealth including students, teachers, and a variety of special-interest groups such as school bus drivers (idle reduction), school nurses (indoor air quality), homeowners (energy conservation), and firefighters (open burning). In addition to the division's full-time EE Specialist, field office staff assist with regional outreach programs as requested. DAQ's air quality curriculum is correlated to state and national learning standards, and formulated primarily for grades 4-8.

The DAQ EE program includes:

- Teacher training
- Classroom and camp programs
- Public events and festivals
- Fire fighter education
- School bus driver trainings (idle reduction)
- Community groups, forums, and conferences
- Media outreach

Air Quality EE program topic areas include:

- Air pollution sources & monitoring
- Open burning and waste reduction
- Clean school buses (idle reduction and retrofit technology)
- Fuel economy and alternative fuels
- Energy conservation and alternative energy sources
- Alternative modes of transit: walking, biking, vanpooling, etc.
- Climate change

Environmental Education Outreach in Fiscal Year 2011

Environmental Education Specialist Roberta Burnes shows off DAQ's new tire resistance display, which allows visitors to demonstrate how much energy is wasted by driving on under-inflated tires. Photo: Sam Ruth

DAQ's Environmental Education (EE) program reached nearly 5000 Kentuckians in 28 counties during FY 2011. Figure 2 shows the audience and numbers for each category of program offered.

School programs drew the largest numbers with nearly 2000 K-12 students participating from 14 counties across the Commonwealth. In addition to general air quality education, teachers requested programs on energy conservation, climate science, and indoor air quality. DAQ is a partner with the KY Green & Healthy Schools program to assist classrooms in completing the indoor air quality inventory, and several schools took advantage of this partnership in FY 2011.

DAQ's EE program also partnered with Fayette County's school district to pilot a voluntary idle reduction program for cars in the carpool lane at Julius Marks Elementary. To measure success of the program, students gathered baseline data prior to the campaign by determining the number of idling vehicles in the carpool lane during drop-off and pick-up times. Next, students encouraged drivers to voluntarily turn the ignition off while waiting in line, thereby protecting air quality around the school while saving gas and money. In addition, "Idle-free Zone" signs were installed in the carpool lane. The pilot project will expand in 2012.

DAQ partnered with several agencies to offer professional development workshops for teachers and school administrators. Partnering agencies included the EPA, KY Environmental Education Council, KY Association for Environmental Education, KY Pollution Prevention Center, Toyota, and 4-H.

DAQ staff created a new, interactive exhibit for use during public outreach programs. The hands-on demonstration helps users make the connection between proper tire inflation, energy consumption and air quality in a concrete way. People visiting the colorful DAQ display at festivals, health fairs, and conferences learned about a variety of air quality issues including open burning, asthma, and energy efficiency.

Open Burning Campaign

Illegal open burning continues to be a serious concern in Kentucky. This year, DAQ developed a new "Learn Before You Burn" billboard as part of a Supplemental Environmental Project (SEP) in cases where open burning violations had occurred. The main goal of a SEP is to raise public awareness of environmental regulations. The new billboards were 100% funded by parties who violated Kentucky's open burning regulations.

A new billboard educates Kentuckians about open burning. The billboards were 100% funded by violators of Kentucky's open burning regulation.

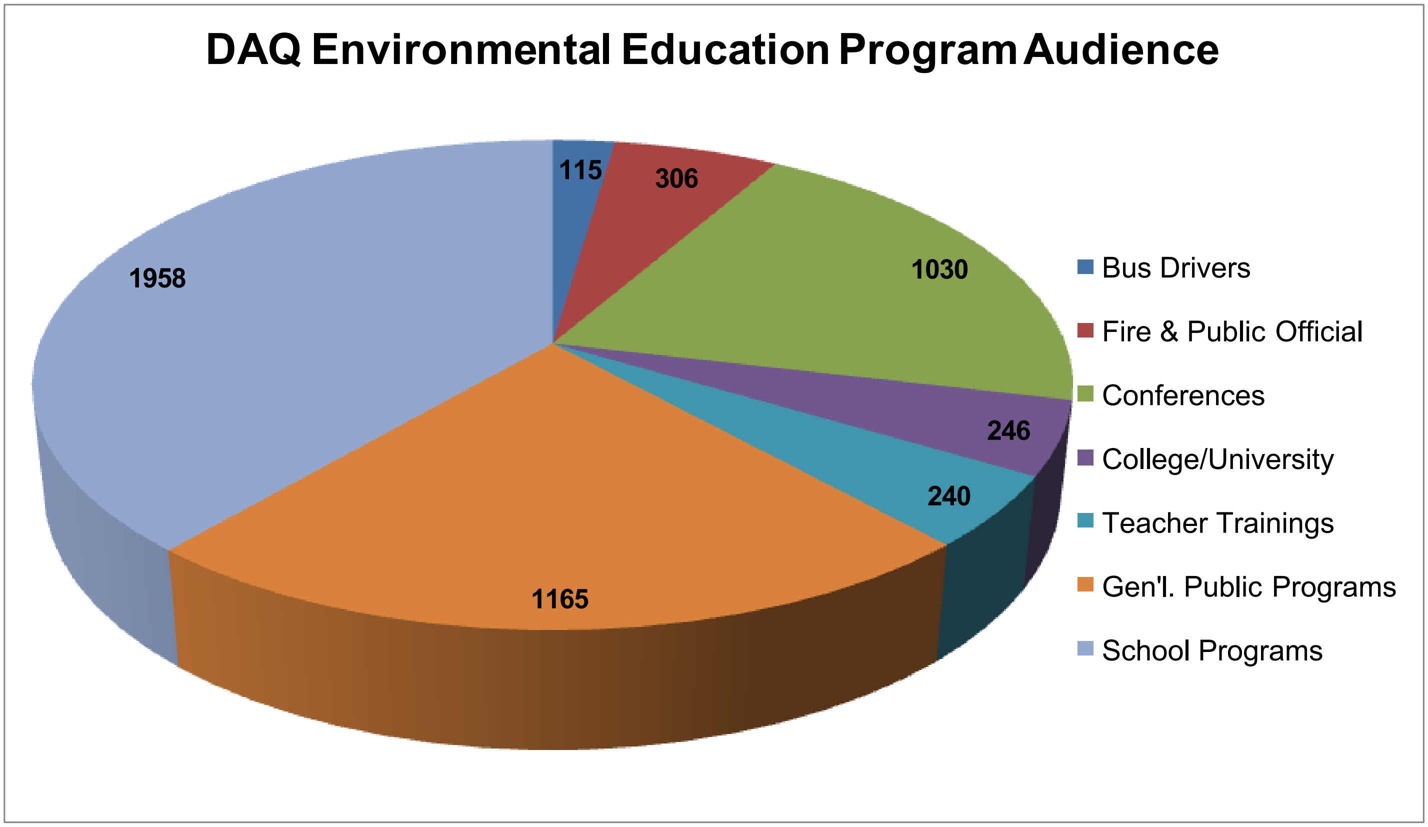


Figure 2: The Division for Air Quality's Environmental Education programs reached nearly 5000 Kentuckians during FY 2011. Schools and public programs comprised more than half of the audience.

Billboards were used in 11 different enforcement settlements in western and south-central Kentucky. Each billboard was sited in a high-traffic, high visibility area and was leased for 4 to 12 weeks at a time.

DAQ also partnered with state and local solid waste coordinators, as well as local fire departments and county fiscal courts, to raise awareness about open burning issues in Kentucky. 104 fire fighters attended trainings about Kentucky's open burning regulation during FY 2011.

DAQ's colorful new banner greets visitors at outreach events across Kentucky.

Southeast Diesel Collaborative

The Southeast Diesel Collaborative (SEDC) is a regional organization that brings together partners from federal, state and local government, non-governmental organizations, and business to reduce emissions from diesel engines. A wide variety of strategies are utilized by SEDC partners to achieve these reductions, including idle reduction, alternative fuels, and engine retrofits, replacements and repowers. Federal funds, authorized by the Diesel Emissions Reduction Act (DERA), help SEDC partners employ the above strategies in the multiple diesel sectors involved.

DAQ staff maintain an active presence in the SEDC. This year, DAQ Environmental Technologist Shea Hogan continued to work in her capacity as an EPA-appointed member of the SEDC Strategic

Planning Committee. The Strategic Planning Committee is responsible for developing the overarching goals and priorities for the SEDC, as well as providing support for the completion of the actions needed to achieve these goals and priorities.

Kentucky Clean School Bus Grant Program

Through the Kentucky Clean School Bus Grant Program, DAQ has awarded nearly $2 million in DERA funds to 26 school districts across the state to help reduce emissions from their school buses. Over $1.73 million of this funding was authorized by the 2009 American Recovery and Reinvestment Act (ARRA). These school districts are reducing emissions by installing pollution control devices on their school buses and implementing idle reduction policies in their bus fleets. The funded districts include Bell County, Boone County, Fayette County, Franklin County, Jefferson County, and Paducah Independent (utilizing $196,000 in DERA funds), and Ashland Independent, Corbin Independent, Daviess County, Elizabethtown Independent, Floyd County, Frankfort Independent, Franklin County, Gallatin County, Grayson County, Jefferson County, Lincoln County, Livingston County, Madison County, Marion County, Montgomery County, Owsley County, Pike County, Pulaski County, Somerset Independent, Spencer County, Taylor County, and Warren County (utilizing $1.73 million in ARRA/DERA funds).

In the past fiscal year, all of the 26 participating school districts successfully completed their projects by retrofitting their school buses with emission control devices. With this grant program now complete, a total of 748 school buses have been retrofitted, resulting in a lifetime reduction of 9.6 tons of particulate matter (PM), 44.7 tons of hydrocarbons, and 133.9 tons of carbon monoxide (CO). While school buses are the safest way to get students to and from school, DAQ is working to ensure that school buses are also the cleanest way to transport students.

In addition to the bus retrofits performed, each school district also implemented an idle reduction policy in their school bus fleet. The division encouraged this action as a component of participation in the Clean School Bus Grant Program, and DAQ staff provided educational materials, templates, training and support for the adoption and implementation of these policies. By eliminating unnecessary idling in their fleets, schools are able to save money while reducing student and driver exposure to harmful diesel emissions.

Kentucky Clean Diesel Grant Program

In addition to the funds dispersed through the Clean School Bus Program, DAQ also used continuing DERA funds to expand the DERA grant program beyond school buses to include diesel vehicles from all sectors across the state. Two projects utilizing $235,000 in FY09 DERA funds were underway this fiscal year, including a retrofit project with the Lexington-Fayette Urban County Government's refuse hauler fleet and a truck replacement project with an Independent Owner-Operator long-haul trucking operation. The latter project, implemented by Paul and Lynne Fouts of Virgie, KY, was successfully completed during this time and will result in a lifetime reduction of 215 tons of NO_x, 9 tons of PM, 11 tons HC, 76 tons of CO, and 193 tons of CO_2.

Paul and Lynne Fouts stand next to their new 2010-emission-certified long-haul truck. Photo: Division for Air Quality.

In addition, a Request for Proposals for the Kentucky Clean Diesel Grant Program was issued in October 2010 for an additional $235,000 in FY10 DERA funds. Through this competitive round of funding, the Louisville Metro Government was selected to receive the full funding amount in order to implement a retrofit project in their refuse hauler fleet.

Kentucky Clean Fuels Coalition

The Kentucky Clean Fuels Coalition, with support from DAQ, the Kentucky Department for Energy Development and Independence, and numerous other stakeholders, wrote and received a grant from the U.S. Department of Energy to bring the largest hybrid school bus fleet in the nation to Kentucky. When complete, the $13 million grant will facilitate the purchase of 213 hybrid school buses that will be distributed widely across the Commonwealth.

Kentucky Association for Environmental Education

DAQ is an active member of the Kentucky Association for Environmental Education (KAEE), sponsoring the organization's annual conference in September. This year, DAQ Environmental Education Specialist Roberta Burnes served on KAEE's Board of Directors, and coordinated two KAEE professional development workshops for teachers about air quality and climate science. DAQ also presented at numerous conferences of educators and air quality communicators including the KAEE annual conference, the annual meeting of the North American Association for Environmental Education, the KY Science Teachers Association, and the National Association of Clean Air Agencies.

Clockwise starting at left: DAQ EE Specialist Roberta Burnes fills a balloon with car exhaust during the Clean Air Kid's Camp in December 2010 (photo: Jon Trout); Jacob Alteri explores the concept of miles per gallon at the Kid's Camp (photo: Jon Trout); Jessica Santangelo participates in one of several DAQ teacher workshops at the KY Association for Environmental Education annual conference (photo: Deb Spillman).

FIELD OPERATIONS

The Field Operations Branch (FOB) is the largest branch of the division and is currently staffed by 71 employees that include supervisors, administrative staff, air source inspectors, asbestos inspectors, field support staff, and air monitoring specialists. FOB field staff are located in eight regional offices, and have the following primary duties:

1) Complete unscheduled inspections to ensure that permitted facilities and non-permitted entities maintain compliance with federal and/or state air quality regulations;

2) Operate and maintain 113 air monitoring units located at 34 stations scattered throughout the state to measure ambient air quality and determine whether pollutant concentrations remain within EPA established limits; and

3) Investigate, within five business days, air quality complaints received from the general public and other sources each year.

"The Field Operations Branch has managed to retain a very high percentage of employees over the last year. Thorough on-the-job training and completion of technical training courses have significantly improved staff skill sets. Regional office staff should be commended for maintaining high productivity levels during these economically challenging times."

Kevin Flowers
FOB Branch Manager



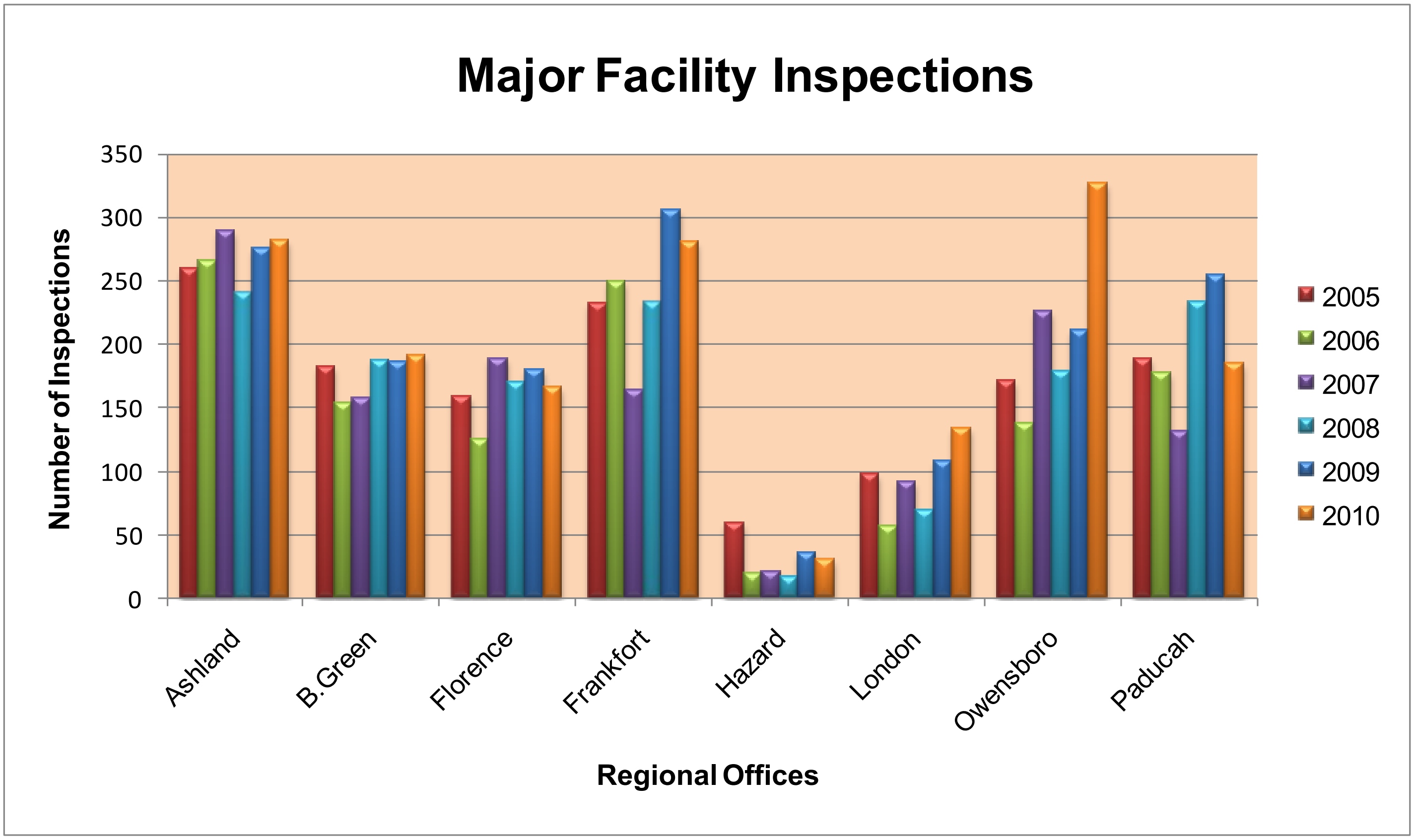


Figure 3: Number of major stationary facility inspections in Kentucky. The lower inspection numbers in the Paducah Regional Office are the result of several open staff positions that remained unfilled during FY 2011 due to budgetary constraints.

Inspections

One of the primary duties of the FOB is to inspect sources of air pollution for compliance with air quality regulations and if applicable, permit conditions. The measures for the success of FOB's compliance-monitoring program are:

- Number of major stationary source inspections conducted (Figure 3);
- Number of minor stationary source inspections conducted (Figure 4);
- Number of asbestos inspections conducted (Figure 13);
- Compliance rate of stationary source inspections (Figure 5);
- Rate of compliance with 401 KAR 63:005 - open burning (Figure 8);
- Rate of compliance with 63:010 - fugitive emissions (Figure 10); and
- Rate of compliance with 401 KAR 53:010 - odor (Figure 12).

In calendar year 2010, FOB staff completed 3795 compliance inspections of various types at either non-permitted or permitted sources (major Title V, minor). Types of inspections included full compliance evaluations, partial compliance evaluations, records reviews, compliance demonstrations (stack tests), asbestos inspections, follow-up inspections of documented violations, and self-initiated inspections of suspected violators.

The regional offices with more inspections for major facilities (Figure 3) are located in areas of the state with a higher number of major permitted facilities, which include power plants, manufacturing facilities and chemical processing plants. The regional offices with more inspections for minor sources tend to be located in areas of the state with a larger population base, leading to more minor pollution sources, such as auto body/paint shops and dry cleaners (Figure 4).

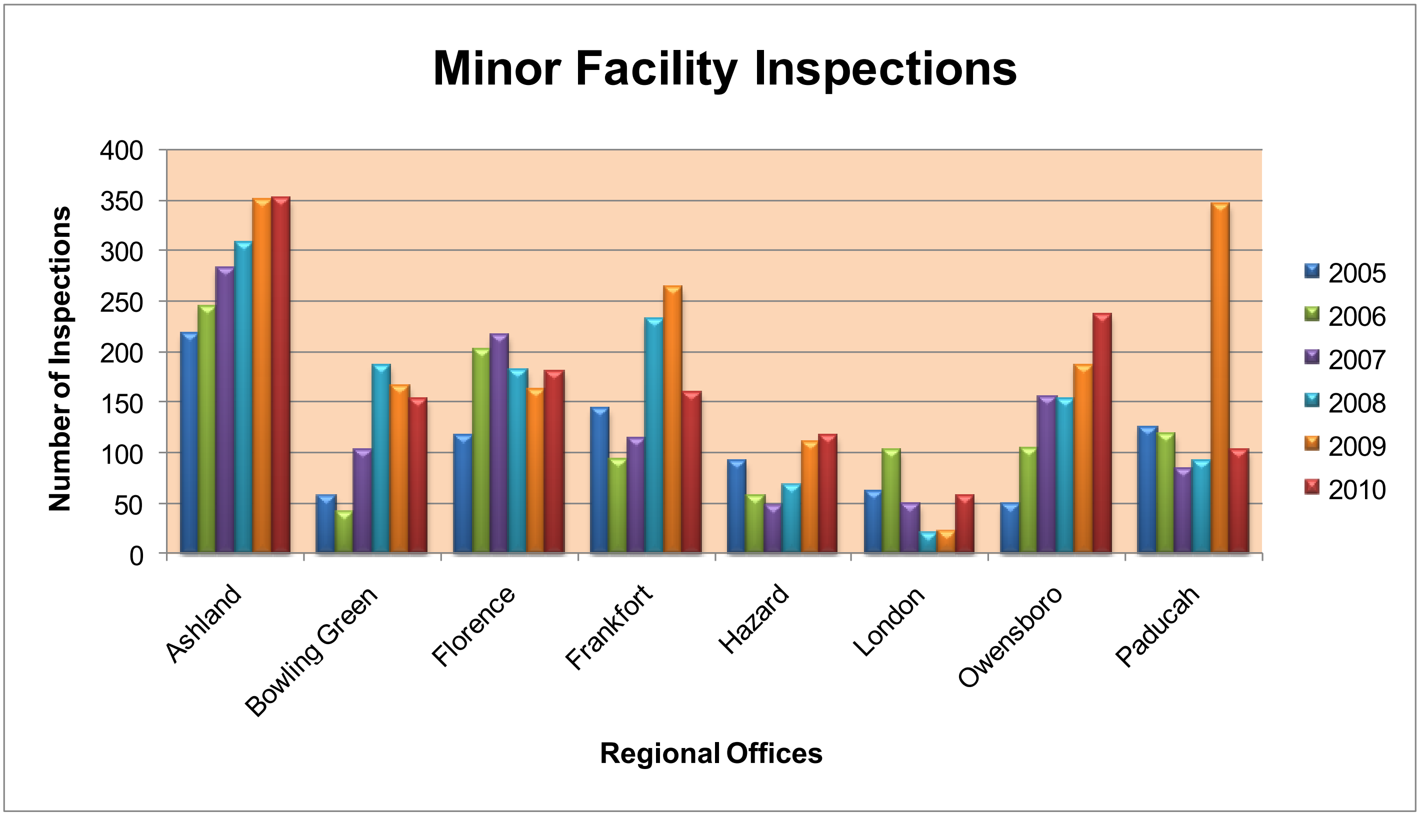


Figure 4: Number of minor stationary source inspections, 2005 - 2010, excluding complaint investigations.

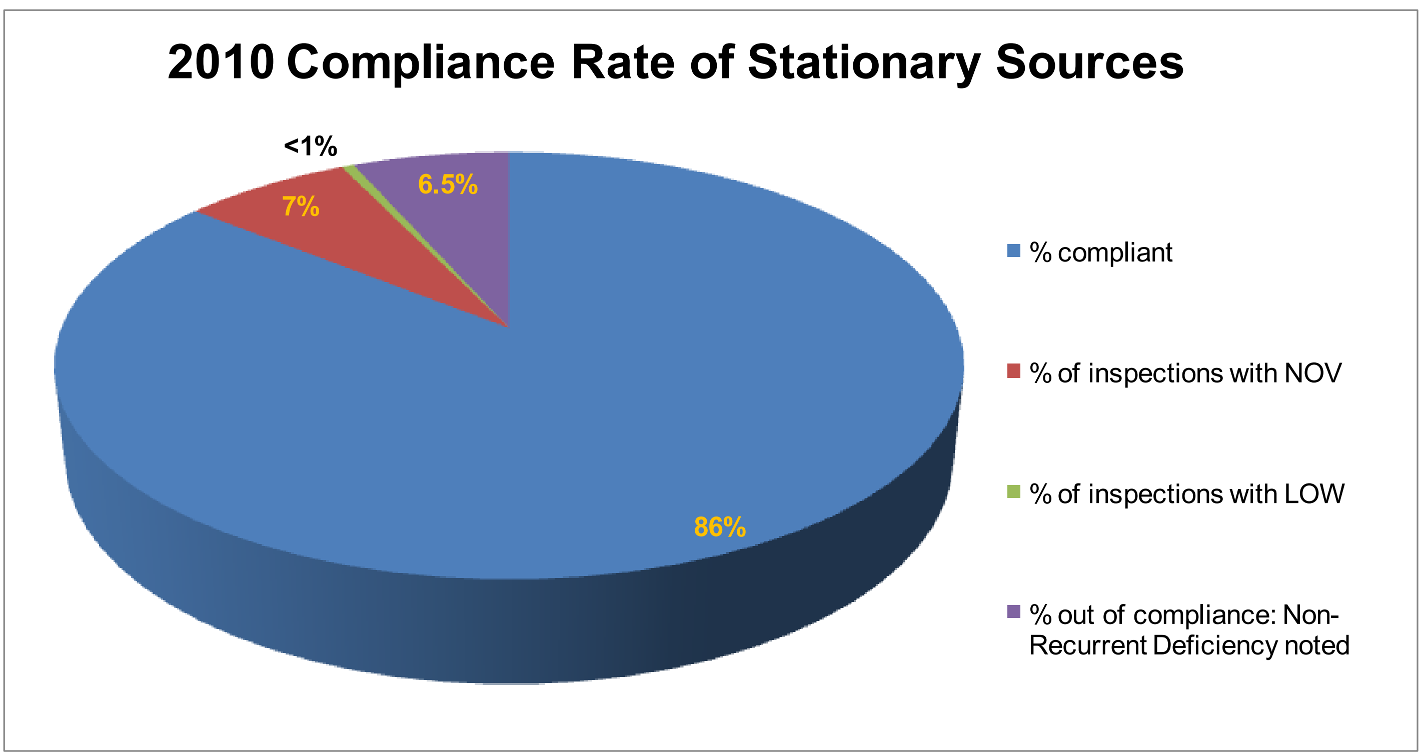


Figure 5: The compliance rate of regulated stationary sources inspected by field office staff in 2010 was 86%. Notices of Violation were issued to 7% of Kentucky's stationary sources, while less than 1% received Letters of Warning. 6.5% of violations were considered minor or were quickly corrected, eliminating the need for any formal enforcement action.

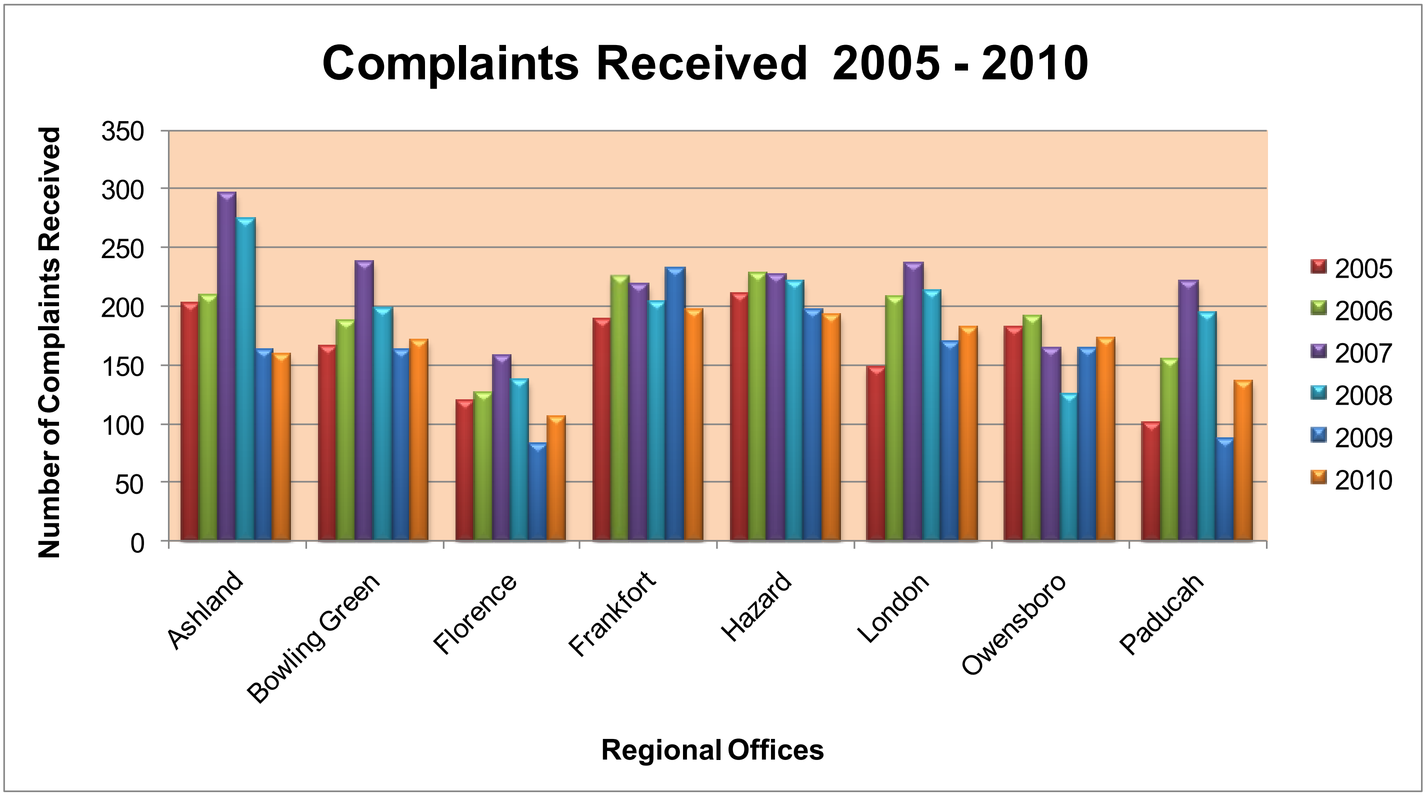


*Figure 6 : The numbers of complaints received during the last six years, **not including** asbestos complaints.*

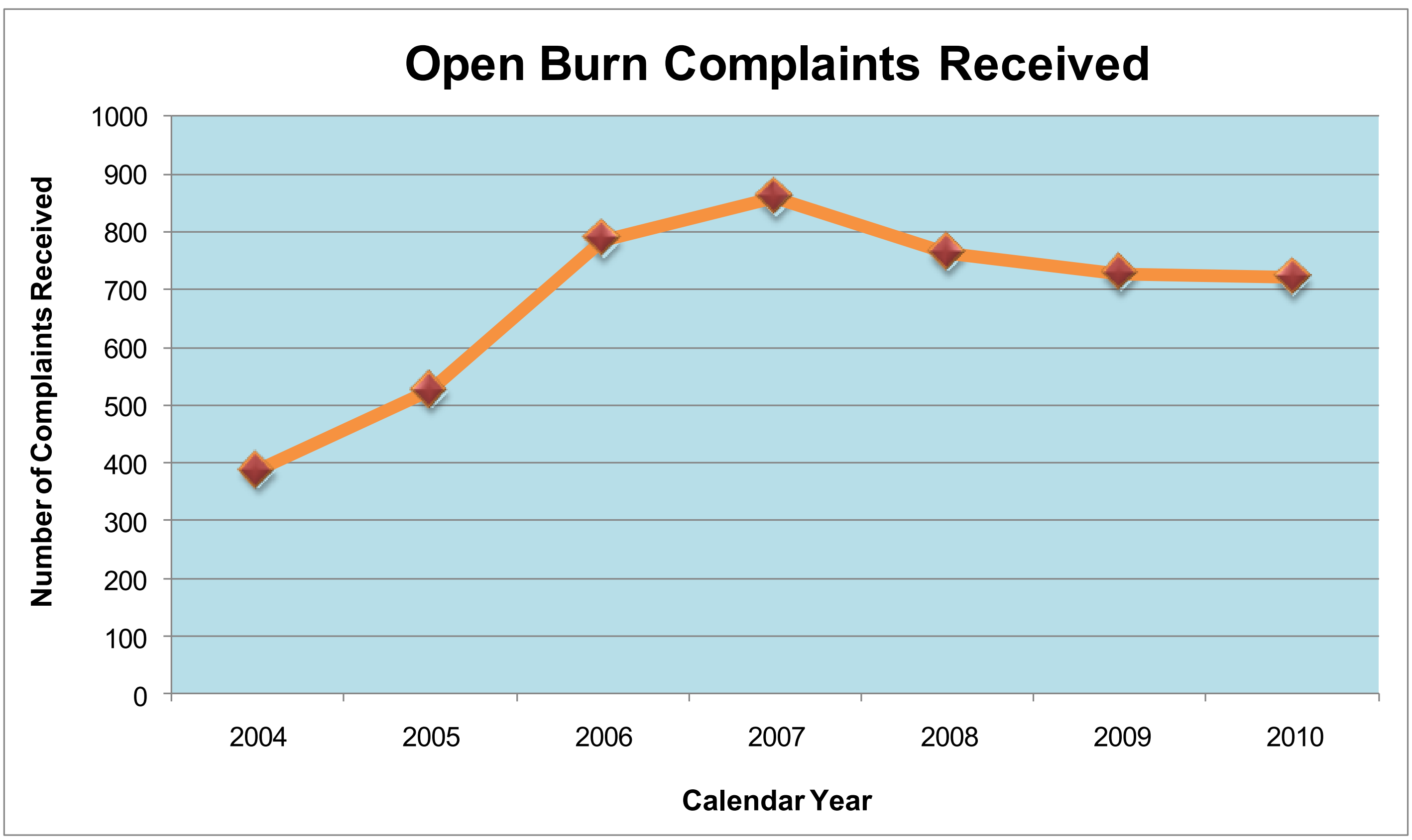


Figure 7: Complaints received about open burning. Education and outreach campaigns targeting illegal open burning may be driving the increase in open burning complaints and associated violations in recent years.

An example of an illegal open burn. Smoke from tire burning releases toxic chemicals and particulate matter into the air, and can also pollute the groundwater. Open burning is a serious health issue in Kentucky and has been the target of recent education and outreach campaigns in the Division for Air Quality.
Photo: Division for Air Quality.

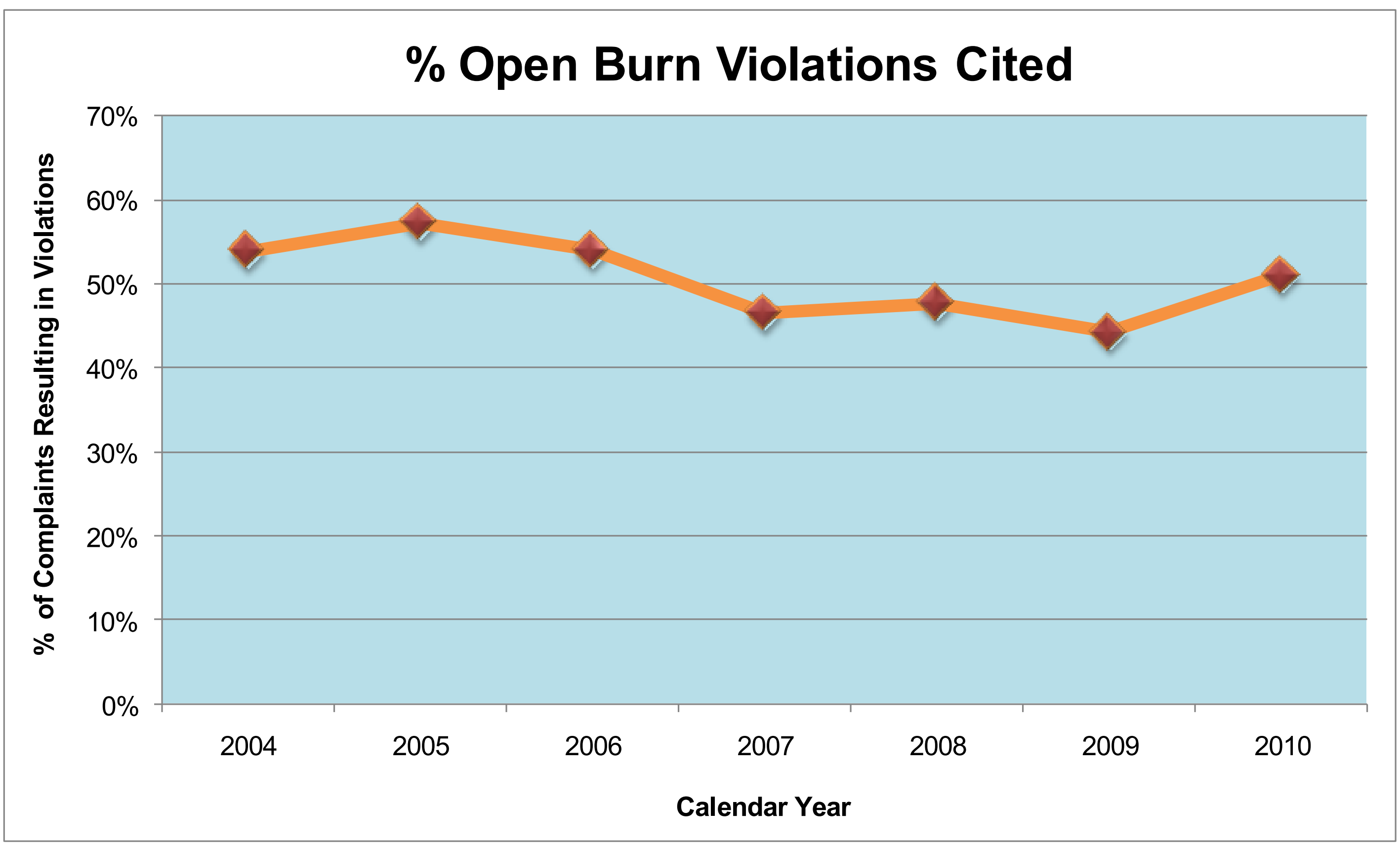


Figure 8: Compliance with the open burn regulation. The increase in open burning citizen complaints means we actually observe more open burns, yet many of these burns are determined to be legal open burning.

Complaint Investigations

Investigating complaints consumes a significant portion of field office staff time. In 2010, field office inspectors received a total of 1313 complaints resulting in 1359 field investigations.

The combined 5154 inspections and complaint investigations resulted in the issuance of 623 Notices of Violation and 70 referrals to the Division of Enforcement for additional enforcement. Data on the rates of violations resulting from investigations are included in figures 8, 10, & 12. The violation rates for open burning are necessarily high, since we only respond to citizen complaints of open burning or as we discover them in the course of other duties. Kentucky does not have a statewide open burn permit program, so total number of actual open burns is unknown. In 2010, slightly more than half of all complaints were found to be illegal open burning.

The fugitive emissions violations rate has been fairly low over the years with violations occurring at a high of almost 16% of all investigations in 2007 to a current low of about 3.2% of the investigations in 2010. The 2007 drought in Kentucky is likely a major contributing factor in both the number of complaints received and the number of violations discovered that year.

The odor rates have varied through the years, with the number of odor complaints peaking in 2008. The rate of violations per odor complaint received peaked in 2007 but have been trending downward through 2010.

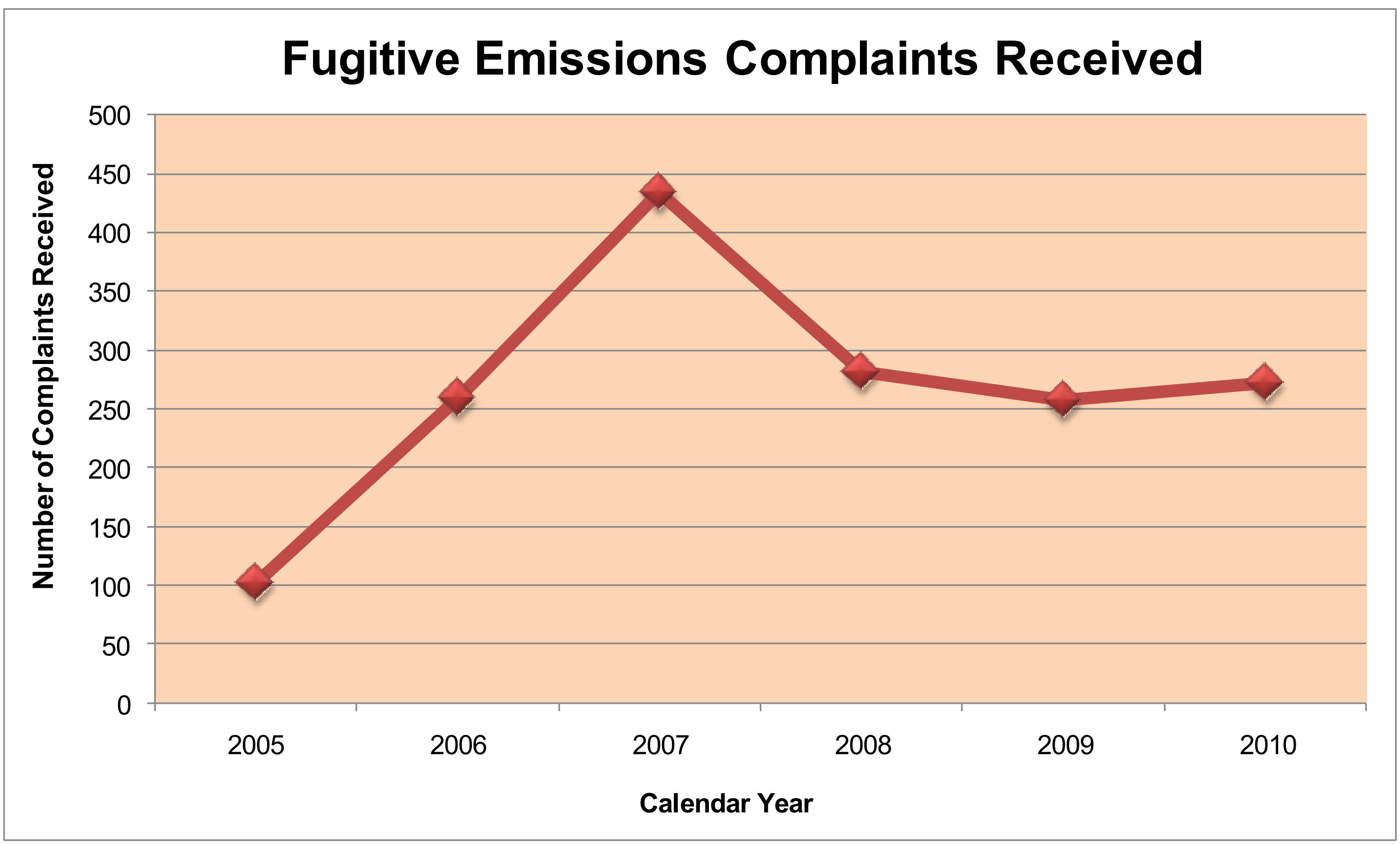


Figure 9: Complaints received about fugitive emissions. Fugitive emissions are those that do not come from a stack. Common fugitive emissions are dust from haul roads, quarries, conveyor systems, etc. Complaints often result in a finding of non-compliance.

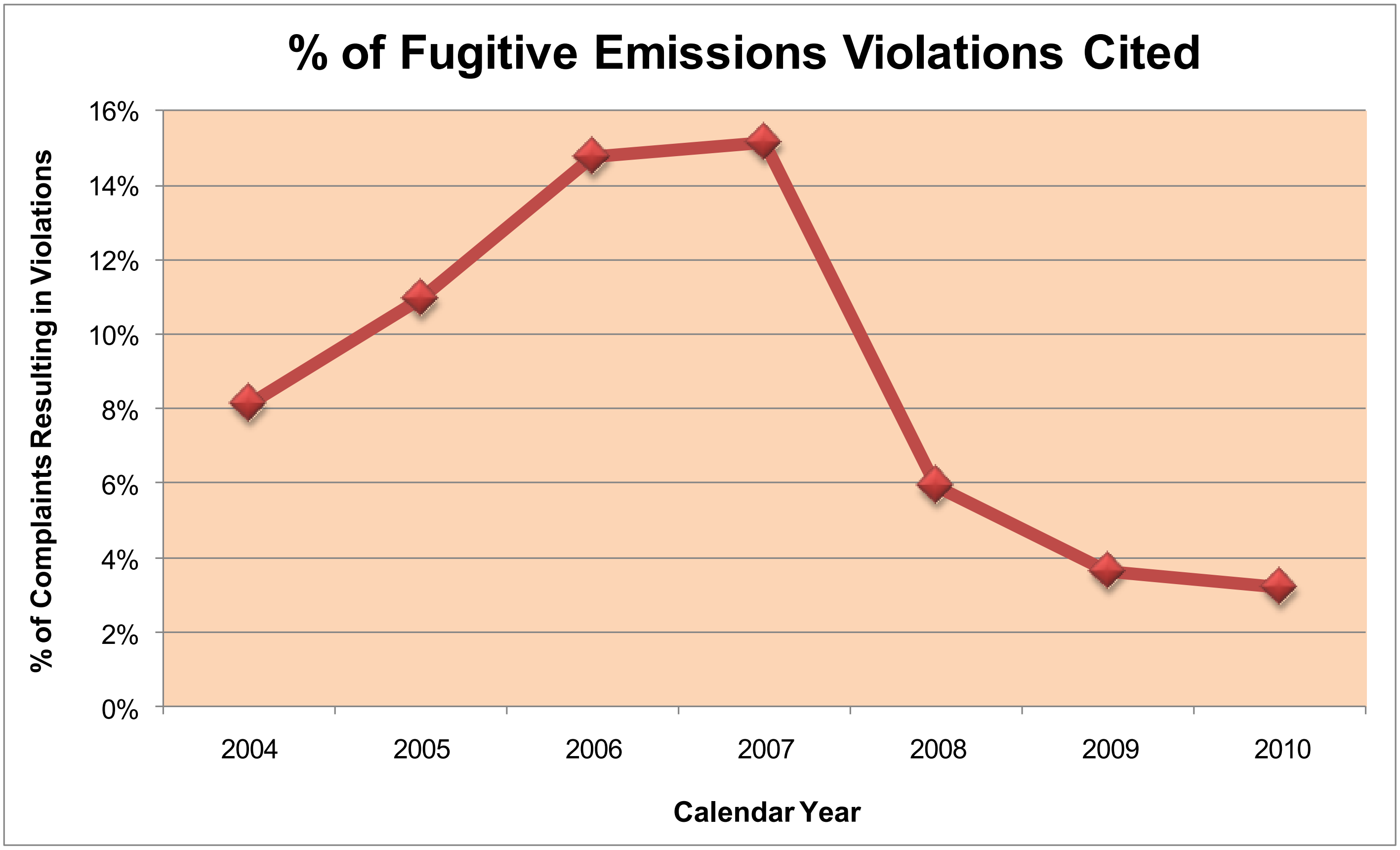


Figure 10: The rate of fugitive emission violations peaked in 2007 and has fallen since then. The drought of 2007 may have contributed to the spike in fugitive emission complaints received in that year. Dry conditions contribute to the formation of fugitive dust and limit the use of water available to control it.

An example of fugitive emissions being released as dust from a cement facility. State regulation requires control measures such as spraying with water to reduce fugitive dust emissions and their impact on air quality. Photo: Division for Air Quality.

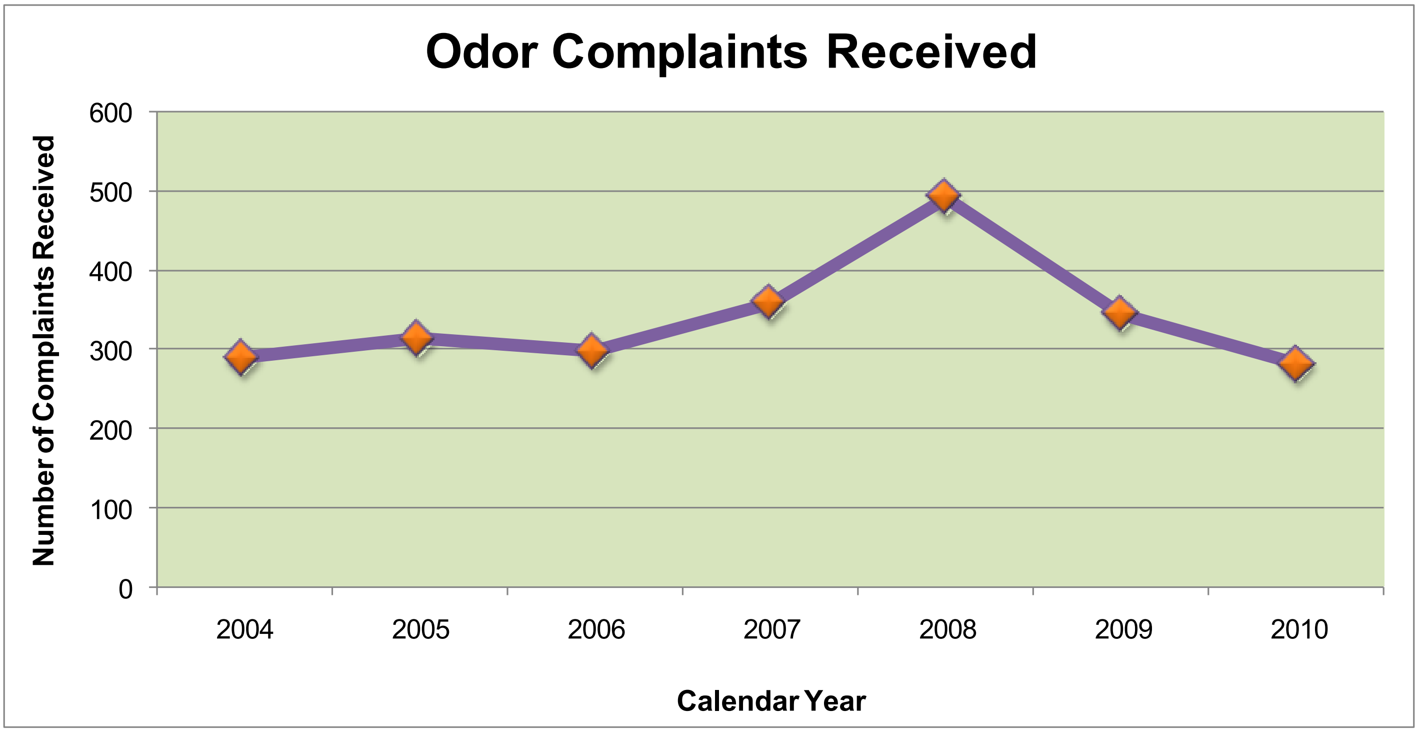


Figure 11: The number of odor complaints and subsequent violations peaked in 2008 and have fallen since. Odor violations occur when an inspector can smell the odor through a "scentometer," which dilutes the ambient air at a ratio of seven to one.

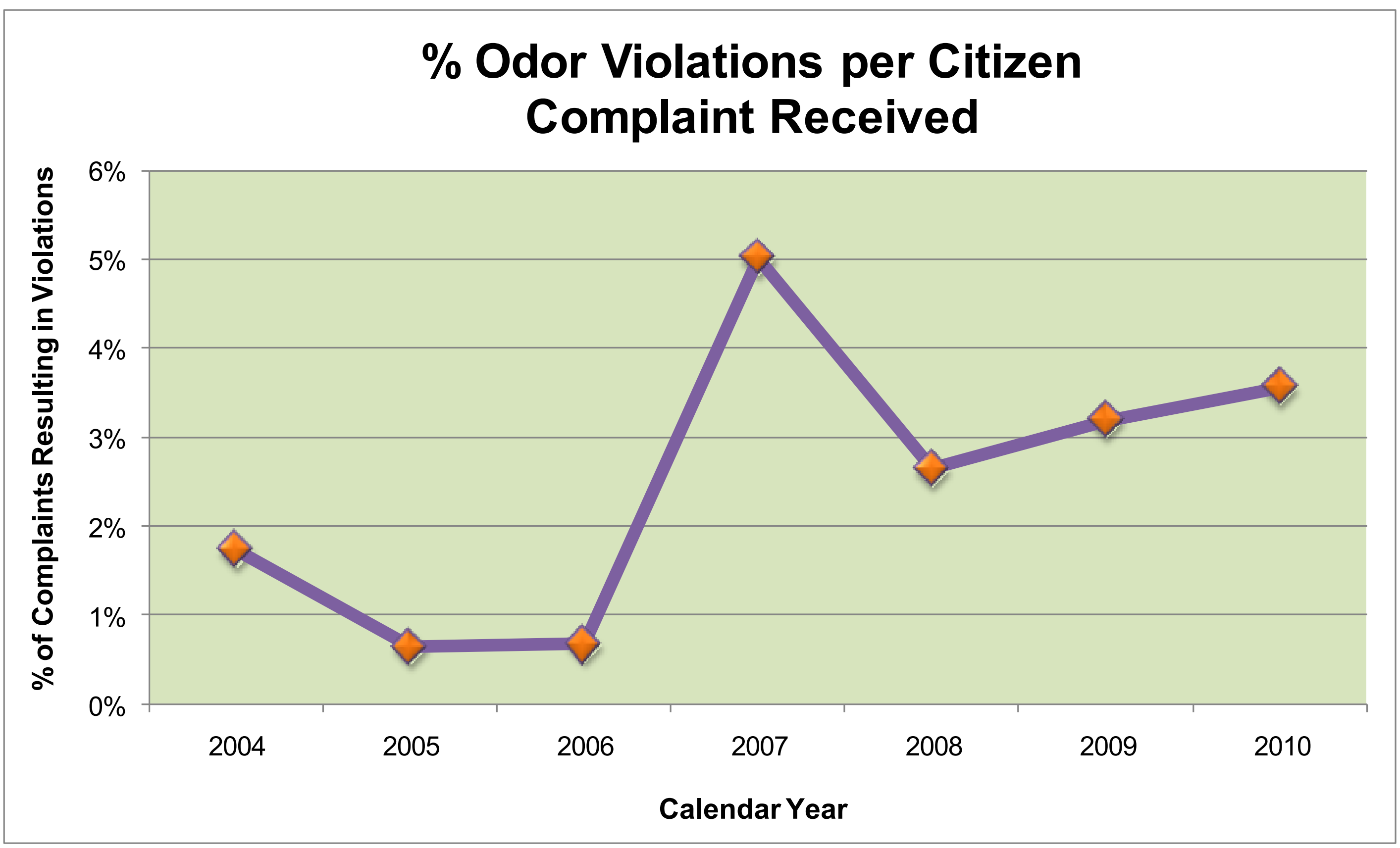


Figure 12: Though no steady trend is notable, the overall violation rate is very low. Strong and steady odors are often required to document a violation of the Kentucky odor standard. Many odors not rising to the level of a violation are, nevertheless, corrected through cooperative efforts between the inspector and responsible party.

Asbestos

Asbestos is a mineral fiber that is used in thousands of consumer products, many of them building materials. Breathing asbestos fibers can cause lung cancer and other respiratory diseases. The EPA has banned some uses of asbestos but has been unsuccessful in its efforts to expand the ban to most other asbestos-containing products.

Without proper precautions, renovations, demolitions, and even routine maintenance can cause asbestos-containing materials to release microscopic asbestos fibers into the air we breathe. Undisturbed asbestos materials can be safely maintained if they are kept in good condition. Before renovating or demolishing a structure, it should be checked for asbestos by a qualified professional. If at least 160 square, 260 linear, or 35 cubic feet of friable asbestos will be removed over a year's time, the removal must be done by a certified contractor using state-of-the-art work practices.

Asbestos removals associated with renovations and demolitions are regulated by the division under the National Emission Standards for Hazardous Air Pollutants (NESHAP). Division regulations also require schools to have their buildings thoroughly checked for asbestos under the Asbestos Hazard Emergency Response Act (AHERA). The surveyed results must be documented in a management plan that describes how all asbestos materials in the school's buildings will be managed safely. Compliance with the asbestos regulations is overseen by the Field Support Section and inspectors from the regional offices.

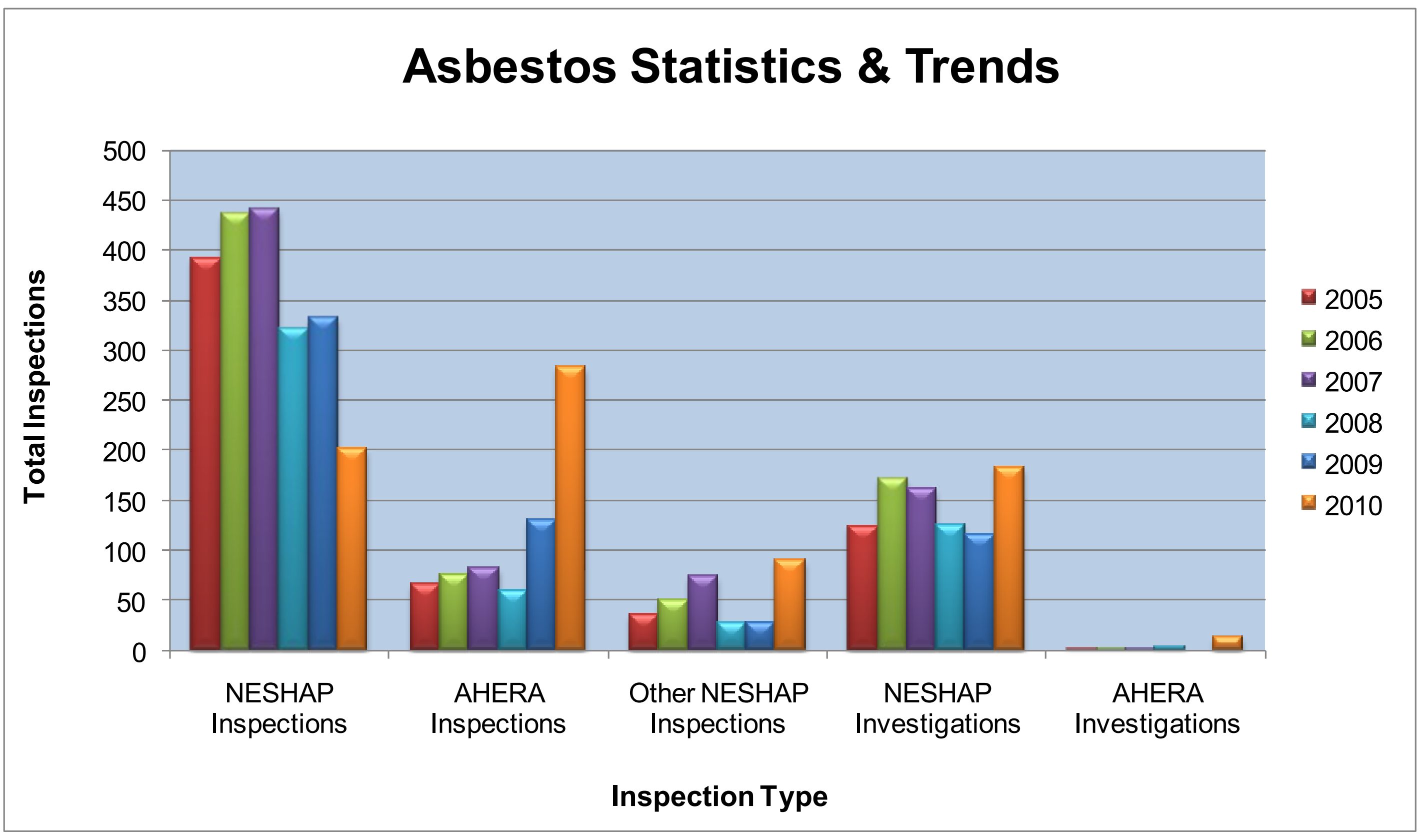


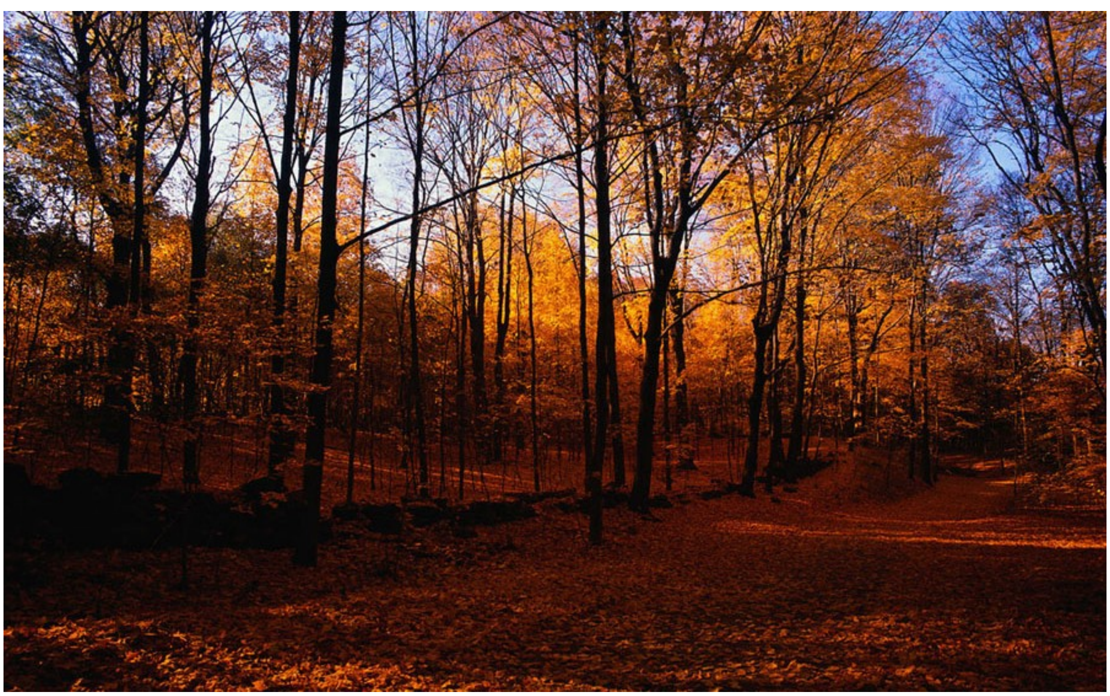
Figure 13: From 2005 to 2010, the number of asbestos inspections and investigations have grown with a slight drop in 2008 attributed to higher staff turnover that year. Routine AHERA inspections increased in 2009 & 2010 as emphasis was placed on this program. While AHERA investigations resulting from complaints are a measure for the program, AHERA-related complaints are rare (averaging one to two per year), so the numbers for some years are not visible in the above chart.

Measures tracked by the division to evaluate the asbestos program's success are as follows:

- Number of asbestos NESHAP and AHERA inspections conducted;
- Number of NESHAP, non-NESHAP and AHERA complaint investigations conducted; and
- Compliance rate of NESHAP and AHERA related inspections and investigations.

The above measures are reflected in Figure 13. In that figure, "Other Asbestos Investigations" refers to inspections of asbestos-related activities that are covered by state rule 401 KAR 58:040 and are otherwise exempt from the federal NESHAP program due to the relatively small quantity of asbestos involved. The state rule addresses smaller operations that may still pose a risk to the public even though they are exempt under federal regulations.

In the case of AHERA inspections, the division's compliance oversight strategy has evolved from a records review approach to an actual site inspection/records verification process. NESHAP inspections have grown due to a combination of increased renovation/demolition projects and increased awareness. Awareness has increased within the regulated community with respect to notifying the division about asbestos removals that need to be inspected, and within the general public, who file complaints about potential violations of the regulatory program. The compliance rate for NESHAP is 88%, while the compliance rate for AHERA is 67%.



PERMIT REVIEW

The Permit Review Branch is divided into several specialized sections:

Chemical Section - Chemical Plants (Organic and Inorganic), Petroleum Refineries, Coal to Liquids, Bulk Terminals, Brake Manufacturing, Plastic Products and Resins, Paper Mills/Pulp Mills, Electronic Components, Nonwoven Fabrics, Rubber Products, Paperboard Mills, Pharmaceuticals, Paint and Allied Products, Carbon and Graphite Products, and Battery Manufacturers.

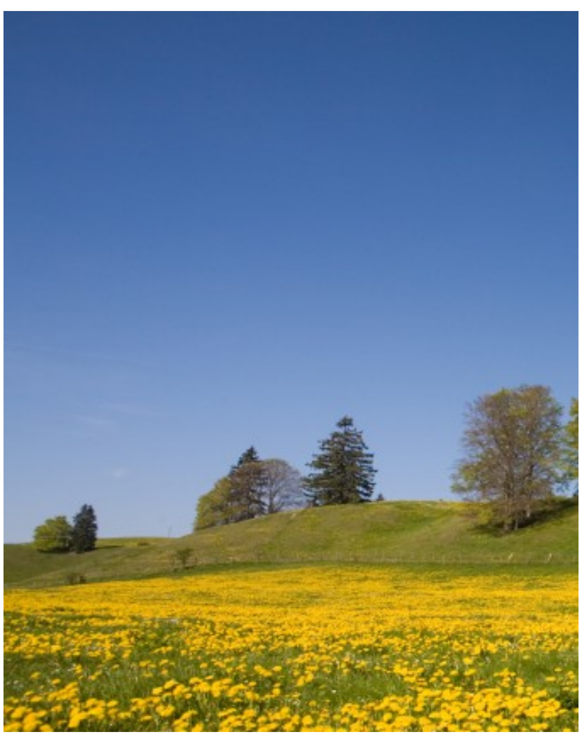
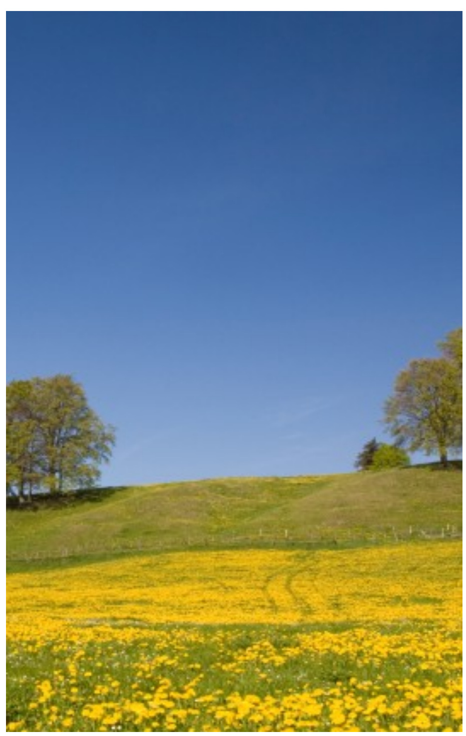
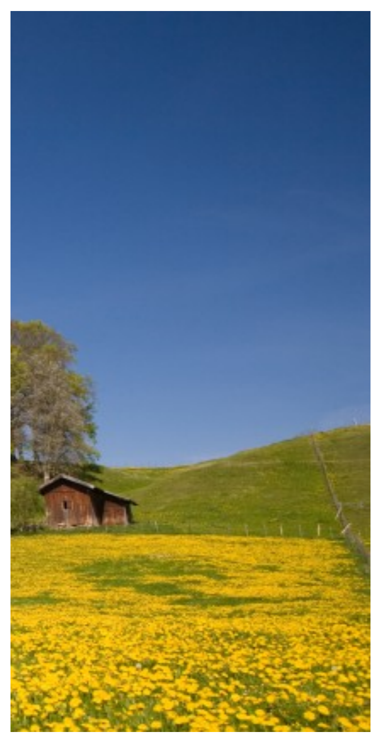
Combustion Section - Brick and Tile Manufacturing, Charcoal Manufacturing, Combustion (Boilers), Distilleries, Glass Manufacturing, Incineration, Natural Gas Transmission Stations, Power Plants, Sawmills, Soil Remediation Units, Tobacco Processing Plants, Electric Utilities.

Minerals Section - Asphalt Plants (Portable and Stationary), Cement Storage Operations, Chicken Feed Manufacturing Plants, Coal Preparation Plants (Portable and Stationary), Coal Tipples (Portable and Stationary), Coal Terminals, Concrete Block Plants, Edible Oil Plants, Fertilizer Operations (Including Blending), Flour Mills, Grain Elevators, Lime Manufacturing Plants, Limestone Crushing Operations (Portable and Stationary), Limestone Terminals, Pet Food Manufacturers, Pre-stress Concrete Plants, Ready Mix Concrete Plants, Sandstone Crushing Operations, Sand and Gravel Operations (Portable and Stationary), Slag Coal Operations, Soybean Extraction Plants.

Surface Coating Section - Automobile and Light-Duty Trucks, Beverage Cans, Fabric, Vinyl and Paper, Flat Wood Paneling, Flexible Vinyl and Urethane, Large Appliances, Magnet Wire, Magnetic Tape, Metal Coil, Metal Furniture, Miscellaneous Metal Parts and Products, Plastic Parts for Business Machines, Polymeric Coating, Pressure Sensitive Tape and Labels, Publication Rotogravure and Flexography Printing.

Metallurgy Section - Primary Steel and Aluminum Producers, Mini-Steel Mills, Secondary Metal Plants, and Various Surface Treatments Of Metals

Air Toxics Section - Any industry that has an air toxics component.

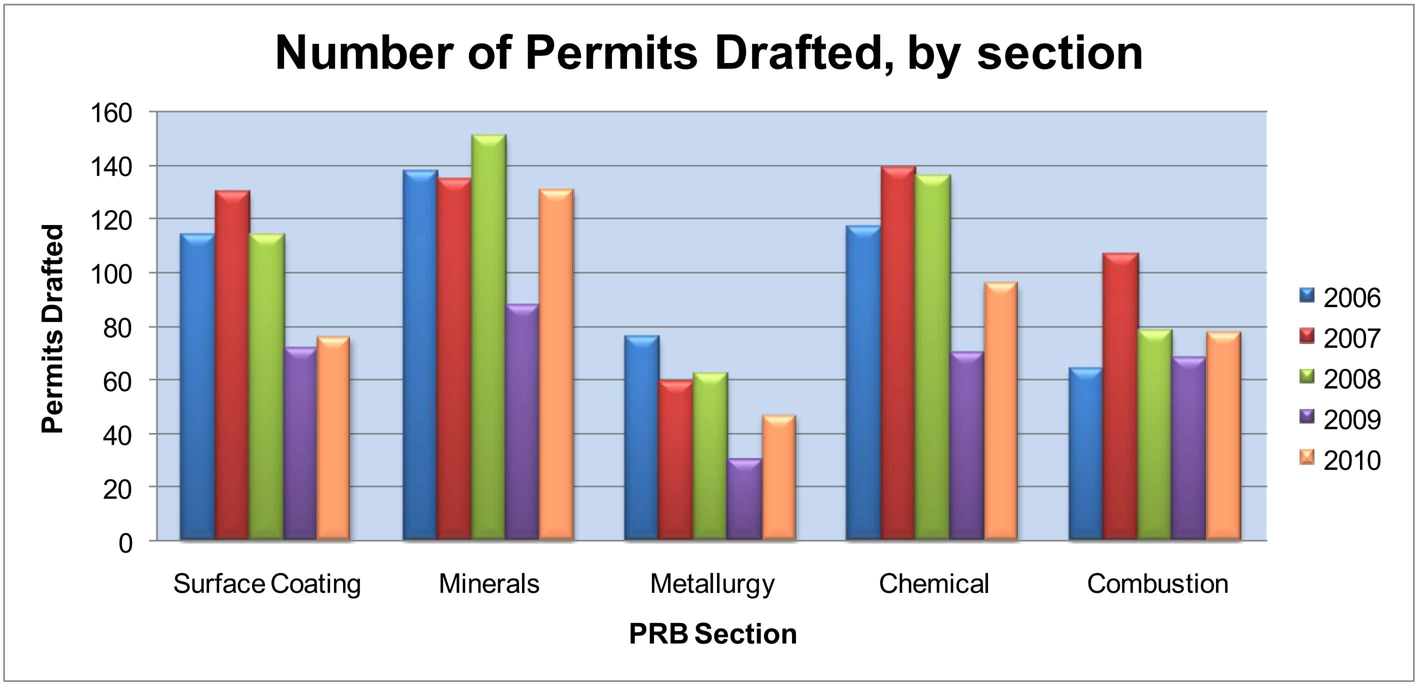


Figure 14: In calendar year 2010, the Division drafted 328 permits, depicted here by section category. The minerals section had the highest number of permits issued, followed by chemical and combustion sections.

PRB Goals and Objectives

In order to achieve the cabinet objective of improving regulatory procedures and implementation, and making Kentucky's regulatory program rational, reasonable and user-friendly, the division has successfully implemented the permit backlog reduction plan originally implemented on June 15, 2006. To date, the backlog of permits beyond the regulatory time frame (RTF) is at an all-time low.

At the close of Fiscal Year 2011, PRB had 192 pending applications in-house. Twenty-four of the applications were beyond regulatory time frames (RTF). It is projected that the majority of the remaining applications beyond RTF will be issued by December 2011.

Figure 15 depicts DAQ's accomplishment in reducing the backlog since June 2006, at which time the division had 716 applications in house. The current number of pending applications represents a 73% reduction since that time.

The surrounding charts highlight DAQ success in the following measures for permit backlogs:

- The total number of permits pending (Figure 15).
- The total number of permits pending that exceed regulatory time frames (Figure 15).
- A comparison between the numbers of new applications versus completed reviews (Figure 16).
- The percentage of permit reviews completed within regulatory time frames (Figure 17).
- The percentage of permit reviews completed that exceed regulatory time frames (Figure 17).

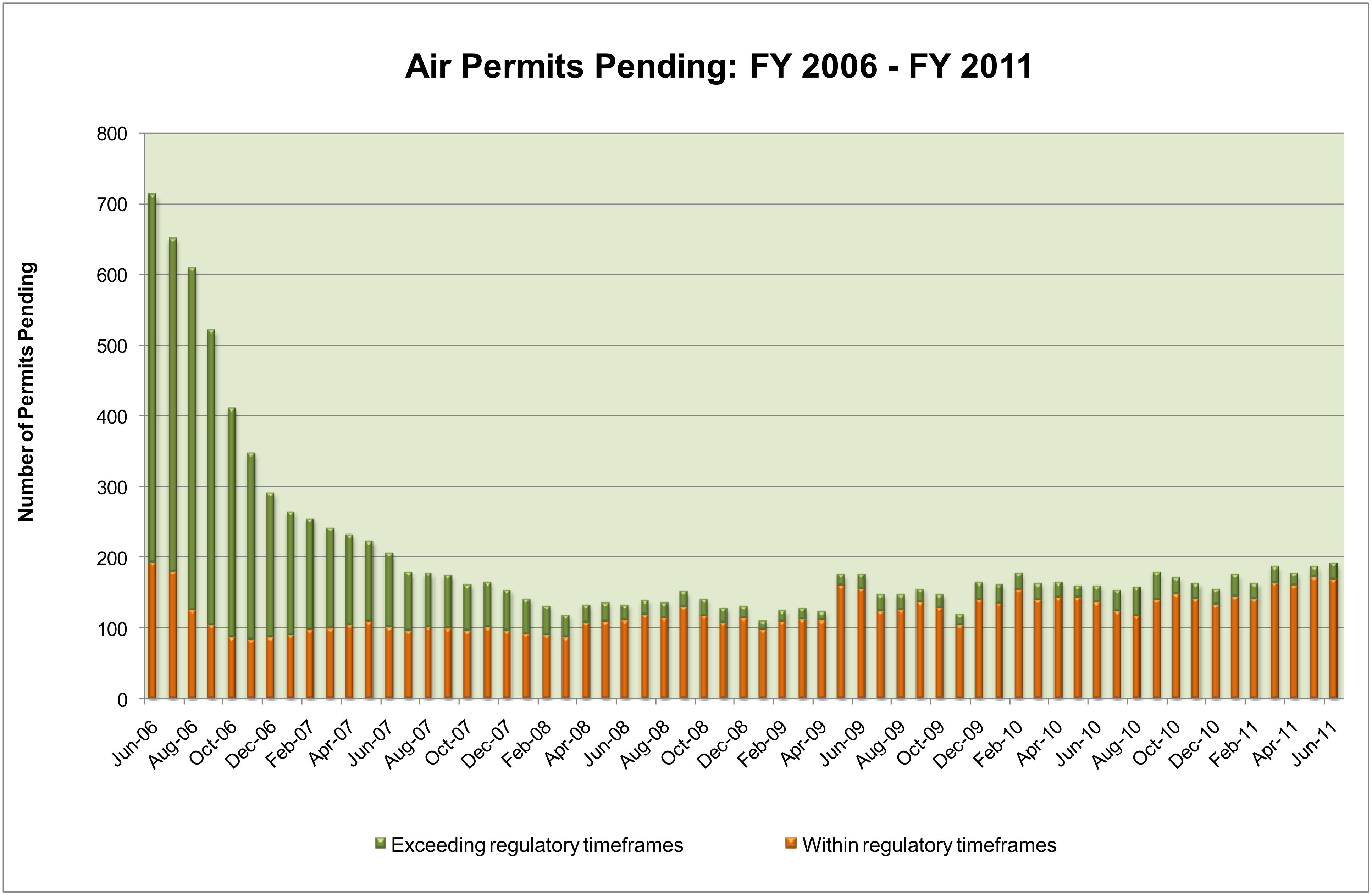


Figure 15: From June 2006 to June 2011, the Permit Review Branch has greatly reduced the amount of permit applications pending a final permit issuance as well as the percent of air permit applications that are beyond the Regulatory Time Frame (RTF), the allotted time for the complete permitting process. In June 2006, 521 of 716 pending permits were beyond the Regulatory Time Frame (RTF). By June of 2011, only 24 of the 192 pending permit applications were beyond RTF.

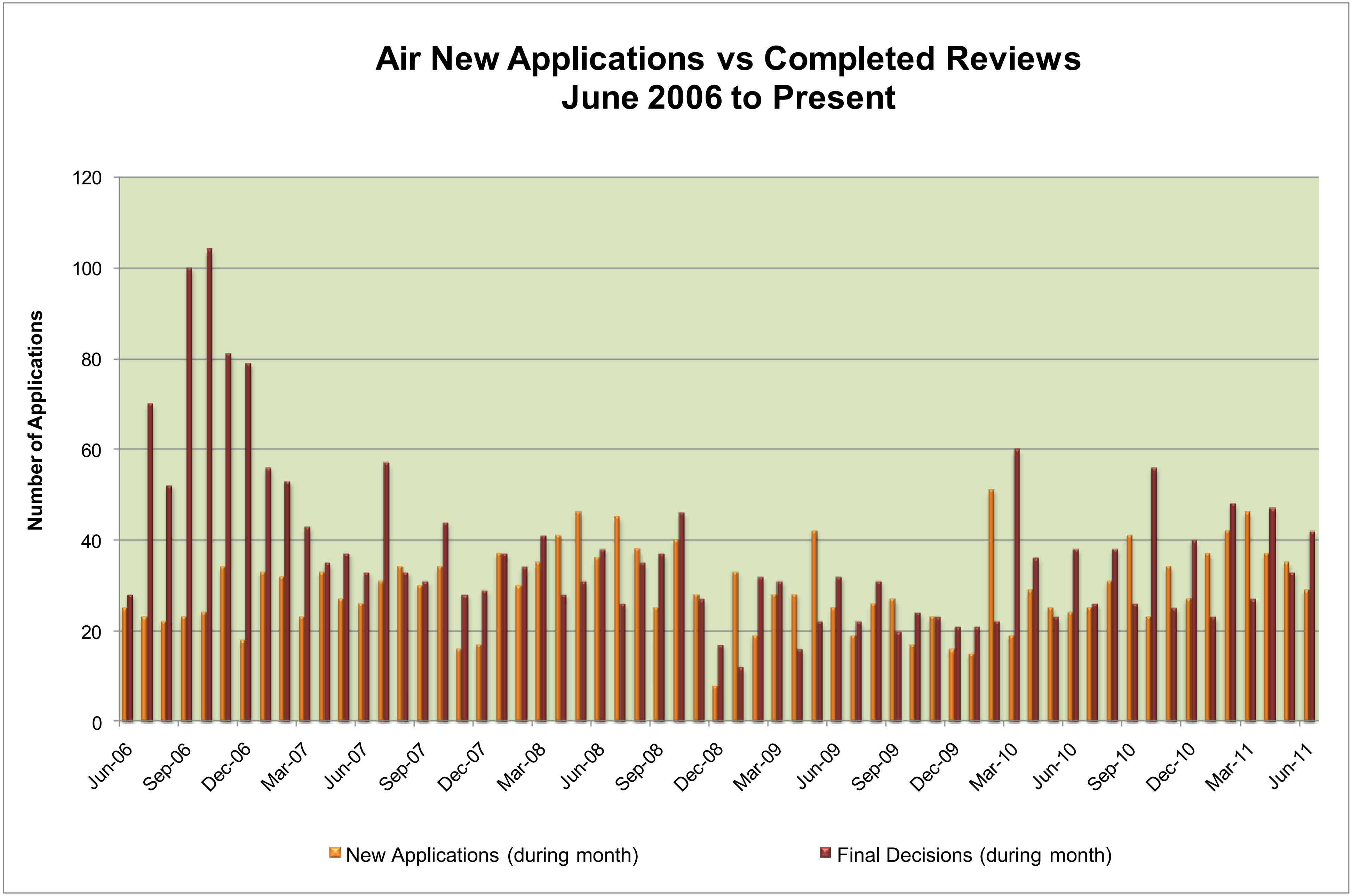


Figure 16: Over the past four years the number of completed reviews have exceeded the number of new applications received by the division. Consistent efficiency has led to a dramatic reduction in the backlog.

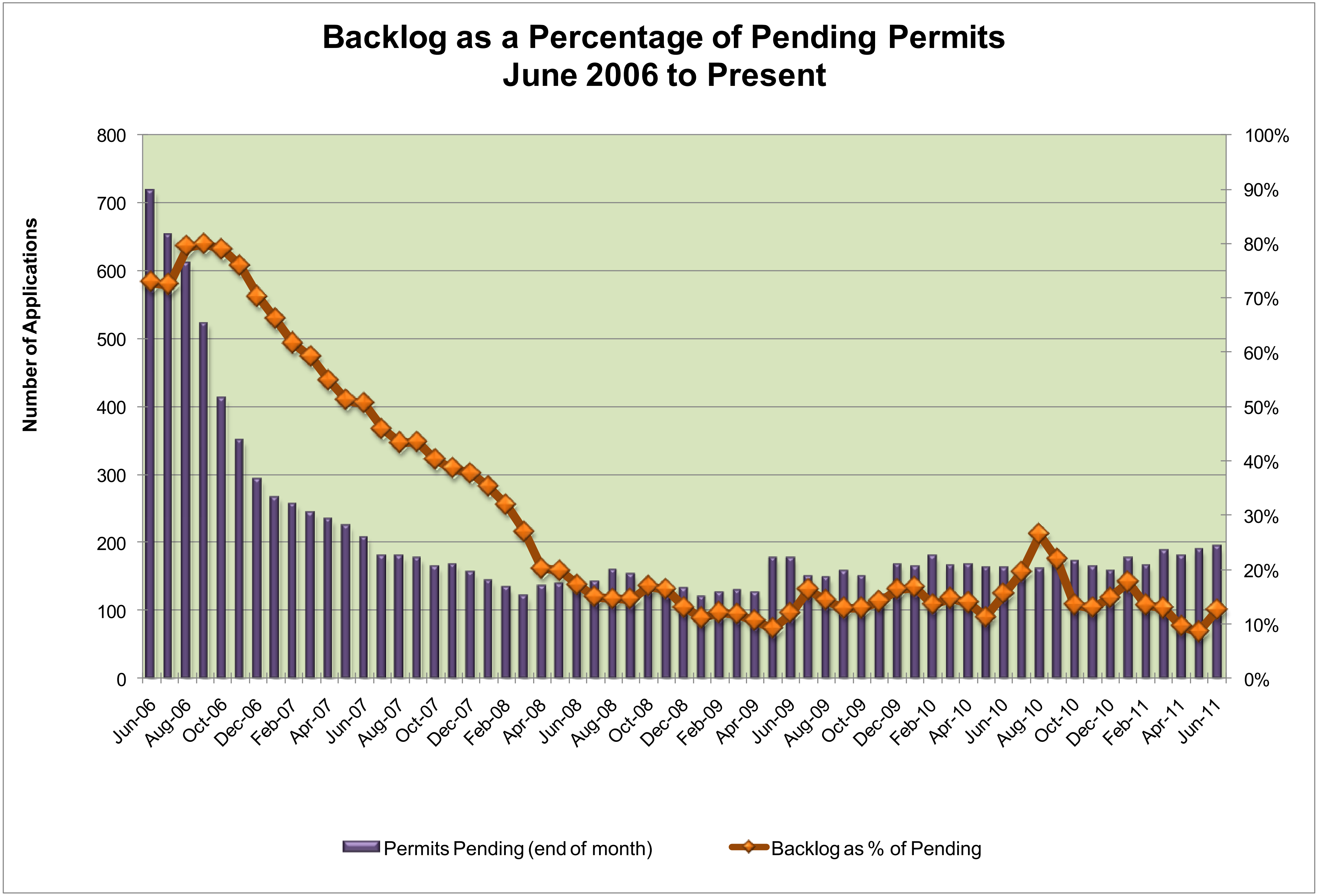


Figure 17: In June 2006, 73% of the pending permits were beyond the Regulatory Time Frame (RTF). By June of 2011, only 12% of pending permit applications were beyond RTF.

Air Toxics Program

The Division for Air Quality established the Air Toxics Section in FY 2008. The section's main objective is to provide the division with expertise in airborne toxic pollutants, by means of risk assessment, ambient air monitoring, and air dispersion modeling.

Air toxics are chemicals emitted from industry and transportation sources such as cars, trucks, and buses. The Clean Air Act lists 187 of these pollutants (also known as Hazardous Air Pollutants, or HAPS), which have the potential to harm human health over long-term exposure, and have been linked to increased risk of cancer along with other effects including respiratory and neurological effects. Risk levels for these pollutants are based on health impacts over 70 years of continuous exposure.

On the national scale, from 1990 to 2005, levels of toxic air emissions declined by 41%. While this decline is demonstrative of the work of state and federal agencies, levels of air toxics in a local area can vary due to weather patterns and proximity to sources of the pollutants.

Exercising the authority granted under KRS 224 and operating within the scope of 401 KAR 63:020, the Air Toxics Section is specifically charged with identifying air emissions which pose an unacceptable risk to human health and the environment. The regulatory authority primarily relied on by the air toxics section is found in 401 KAR 63:020, which states that "No owner or operator shall allow any

Hazardous Air Pollutant Emissions by Industrial Classification

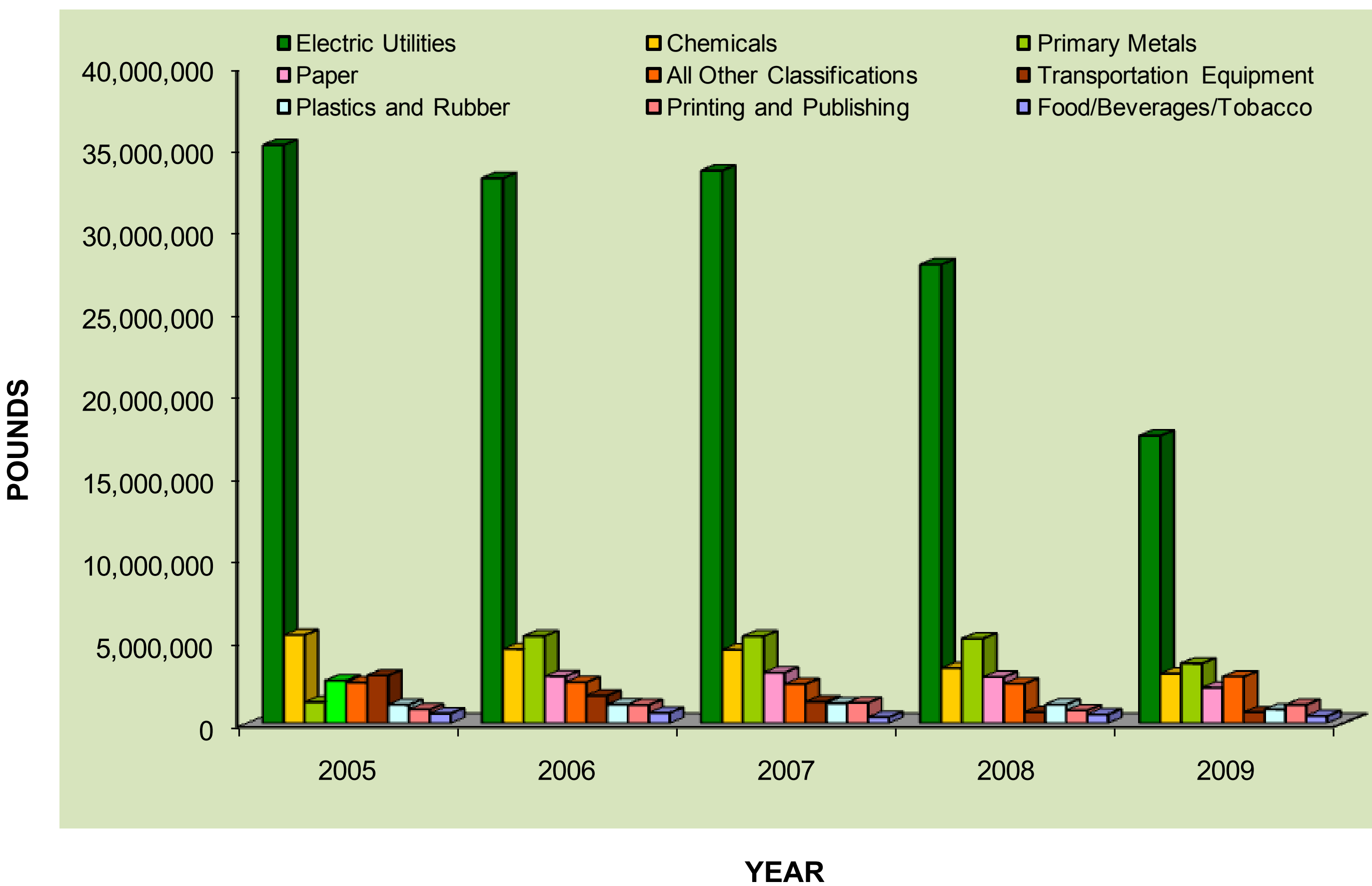


Figure 18: HAP emissions in Kentucky from 2005 through 2009 by industrial classification. Electric utilities (power plants) are the largest emitters in the state, and are responsible for the majority of the hydrochloric acid, sulfuric acid and hydrogen fluoride emitted. Data Source: EPA Toxic Release Inventory.

Total Toxic Air Pollutant Emissions by Chemical, 2005 - 2009

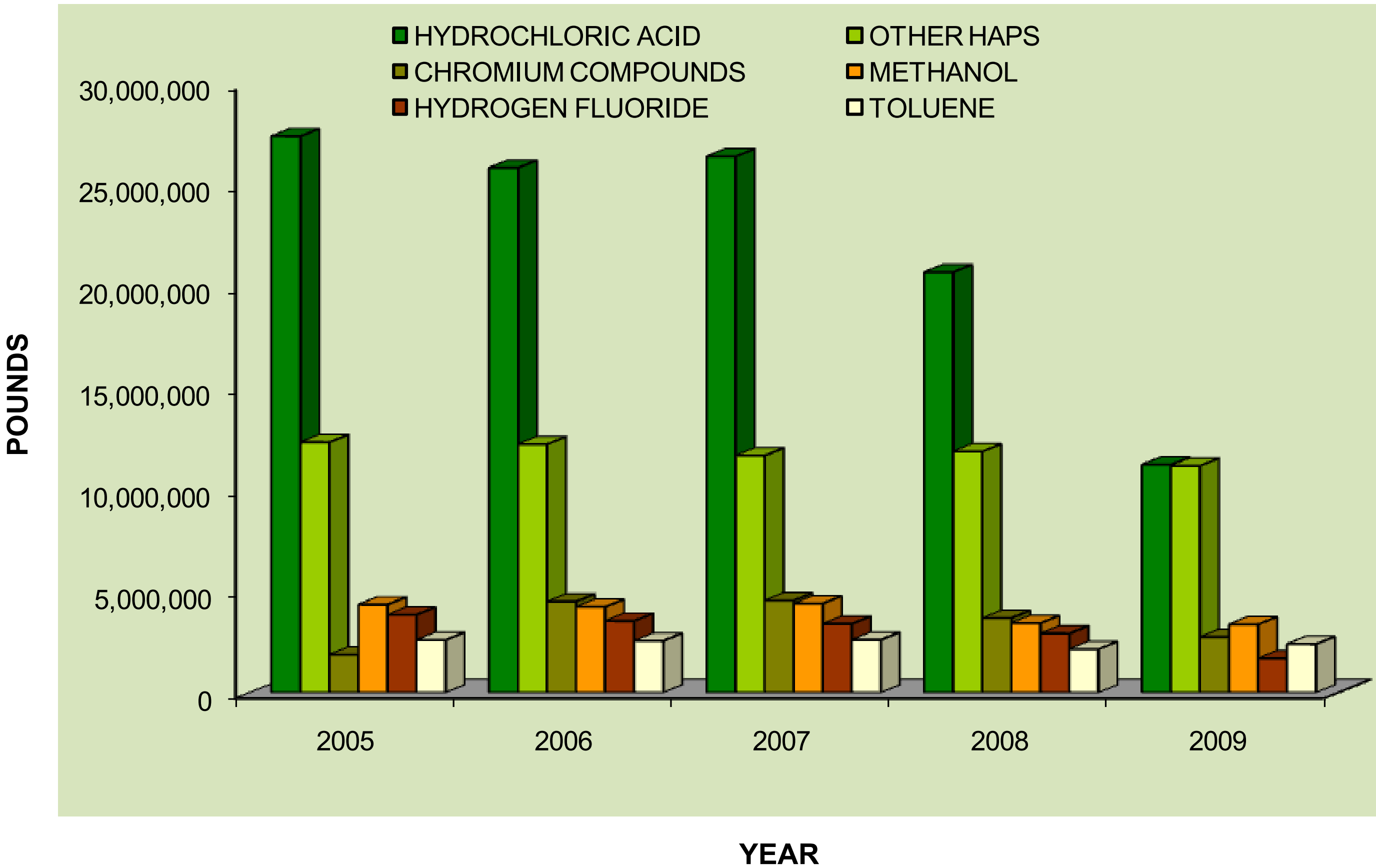


Figure 19: Emissions for selected individual chemicals. Data source: EPA Toxic Release Inventory.

affected facility to emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals and plants." Risk assessment and risk based analysis are the standard means by which the section quantifies how harmful a toxic substance may be and the associated impact to human health.

The EPA's Toxic Release Inventory database provides a means of tracking emissions of toxics, including HAPs. Figures 18-19 represent the trends in hazardous air pollutant emissions over the 2005-2009 period. Figure 20 shows the total statewide HAP releases in Kentucky from 2005 through 2009. More information can be found at http://www.epa.gov/TRI/.

In FY 2011, the Air Toxics Section completed 80 air toxics assessments and 2 HAP- related complaint investigations. The section is capable of sampling both for volatile and semi-volatile organic compounds. The data collected from these sampling events has been used to verify modeled impacts on human health, make permitting recommendations, and in some cases, trigger enforcement actions. Further, the section frequently uses modeling to refine the initial estimates from screening analyses performed by the permit review branch. These refined modeling runs have yielded data which has been used to verify, adjust or establish limits in permits, justify permit conditions, and improve public health and air quality.

Total Hazardous Air Pollutant Releases in Kentucky 2005 - 2009

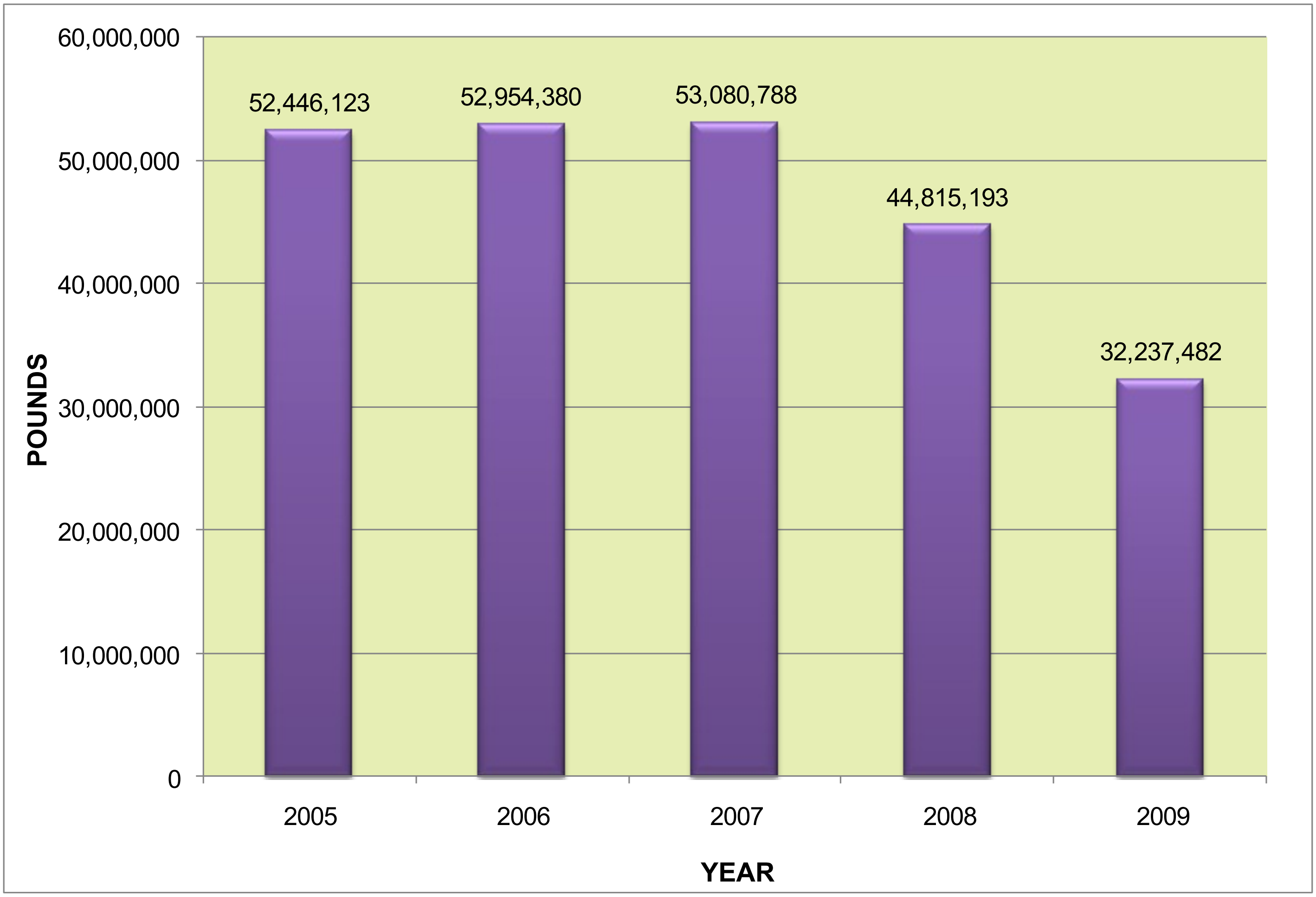


Figure 20: Total HAP releases in Kentucky, 2005-2009. In comparison to 2007 data, the values reported for the past two years are drastically lower. This is due to the metric used in calculating emissions prior to 2008, which included sulfuric acid along with the HAPs in the toxics section. Sulfuric acid is not considered a HAP under the Clean Air Act and is no longer included as a HAP in emissions data. Data source: EPA Toxic Release Inventory

Air Toxics and Kentucky Schools

In the wake of a number of media stories concerning air toxics and the potential for high levels of them in the air outside schools, EPA Administrator Lisa Jackson has made monitoring for air toxics outside of schools a priority for the nation.

In January 2009, the EPA announced a list of 62 schools in 22 states across the country to be monitored for air toxics in the coming months. These schools were chosen based on information that included the mix of pollution sources in the area, scientific information about certain pollutants and their health effects, results of computer modeling, stories from the newspaper series that looked at outdoor air surrounding schools, and information from the Kentucky Division for Air Quality. Monitoring the air outside these schools and measuring the actual concentrations of these pollutants would help the DAQ and the EPA understand if health could be impacted in these areas.

DAQ staff placed monitors at three Kentucky schools during the summer of 2009. A 60-day sampling period began on July 30, and was completed on September 28, 2009. Due to technical

Total Hazardous Air Pollutant Releases in Kentucky 2005 - 2009 (minus Electric Generating Facilities)

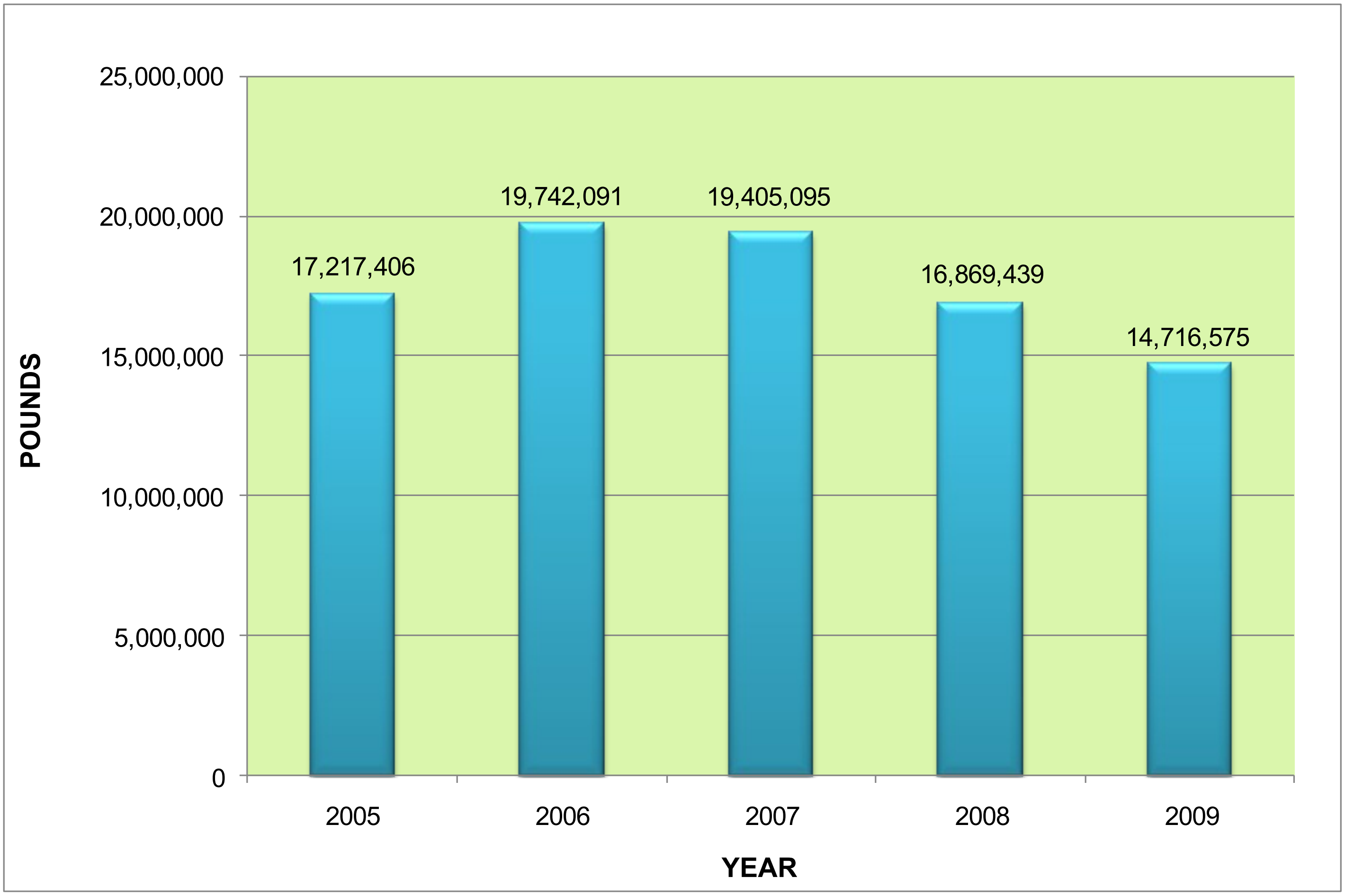


Figure 21: With the influence of electric generation facilities removed, a downward trend in emissions from all other HAP emitting sectors is clearly evident, dropping from over 25 million pounds in 2001 to under 15 million pounds in 2009. Data Source: EPA Toxic Release Inventory.

problems with some of the equipment used in the program nationwide, EPA requested agencies to resample in 2010. DAQ completed its final round of sampling in April 2010. Meteorological monitors continued to collect weather data at these three schools for a short period of time following the completion of the toxics sampling. All sites were officially shutdown and equipment removed by November 2010.

EPA has analyzed the results of the study and will be issuing its final report on Kentucky's schools in the fall of 2011. Data indicates that pollution levels do not pose a health concern and additional monitoring will not be required. Throughout the Schools Air Toxics study, EPA posted results of the air quality monitoring on its website at www.epa.gov/schoolair. The technical report for the Kentucky schools, as well as a brief summary of the study, will be posted at this address.

PROGRAM PLANNING and ADMINISTRATION

The Program Planning and Administration Branch (PPAB) is the planning and implementation cornerstone of the Division for Air Quality. This branch has the responsibility of ensuring that:

"Despite a $1.1 million shortfall in fiscal year 2011, the Division for Air Quality has continued to maintain our high level of customer service to the citizens of the Commonwealth. We constantly evaluate operating costs and expenditures to stay within allotted amounts, while ensuring that the integrity of the air pollution program in Kentucky remains uncompromised."

-Nina Hockensmith,
Administration Section Supervisor

- The agency has adequate budget and staffing resources to meet federal and state requirements for the operation of an air quality control program;

- A comprehensive emissions inventory is performed annually on sources within Kentucky, both to ensure the best information is used to develop and evaluate air quality plans and for use in determining air emission fees required under the federal Clean Air Act;

- Appropriate regulations are researched and promulgated within Kentucky to meet federal and state mandates to control air pollution; and

- Comprehensive plans to attain and maintain the National Ambient Air Quality Standards (NAAQS) are developed and submitted to the EPA for approval. These plans are part of Kentucky's State Implementation Plan (SIP).

Fiscal Management

The Division for Air Quality operates primarily on Title V emissions fees and federal grant funds.

Funding under the Title V program (mandated by the 1990 Clean Air Act Amendments) is through air pollutant emission fees assessed to air pollution sources in the state that meet specific criteria. Further authorized in Kentucky by state statute in KRS 224.20-050, and regulation KAR 50:038, the division is mandated to charge fees sufficient to cover the cost of implementing and carrying out the requirements of the Title V program.

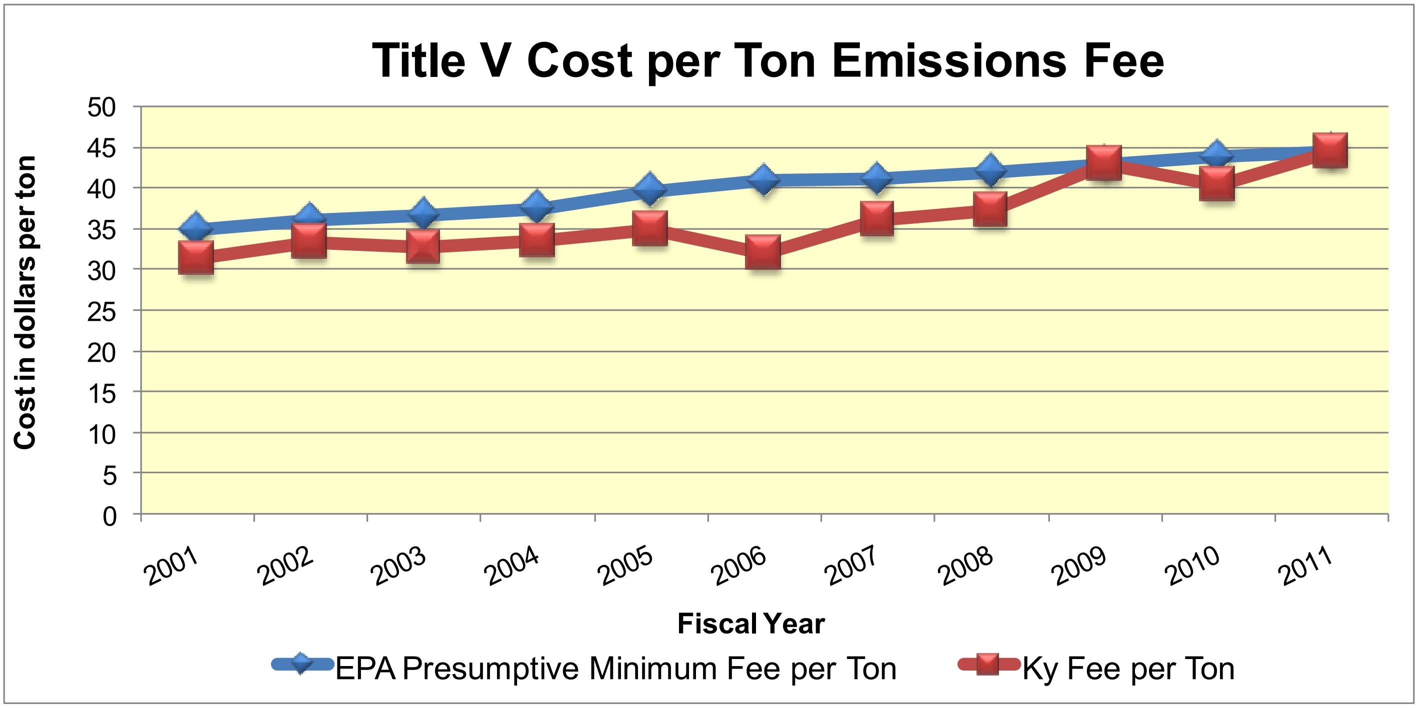


Figure 22: Title V Emission Fees Collected. DAQ surveys regulated entities to determine actual tons emitted by those sources, and charges them a standard cost per ton, according to Clean Air Act and state statute protocol. This chart compares Kentucky's actual fees with EPA's "Presumptive Minimum", which is a suggested minimum fee per ton that states should charge.

The division surveys permitted sources subject to the Title V fee program each year. Once the agency has determined the overall cost of the program for the fiscal year, the number of tons of pollutants that will be emitted in Kentucky will be divided into the projected operating costs to develop a per ton cost. Each source within the Title V program will then be issued a bill based on that per ton cost. Concurrently, EPA determines a minimum costs per ton of pollutant that an agency should charge to fund the Title V permitting program. This is referred to as the presumptive minimum, or the minimum fee, that an agency should charge to fully fund the Title V program. Figure 22 shows the comparison between the EPA presumptive minimum and the actual cost per ton that the division has charged.

The agency also receives federal grants in support of the air quality program. The "general" air quality grant, known as the 105 grant, is in support of the general air quality program and covers such activities as minor (or smaller emitting) source inspections and permitting. It also covers such vital activities as public outreach and transportation coordination in relation to air quality issues. Additionally, the agency also receives specific grants for the operation of the $PM_{2.5}$ monitoring network (103 grant) and asbestos activities (Asbestos Hazard Emergency Response Act) within the state.

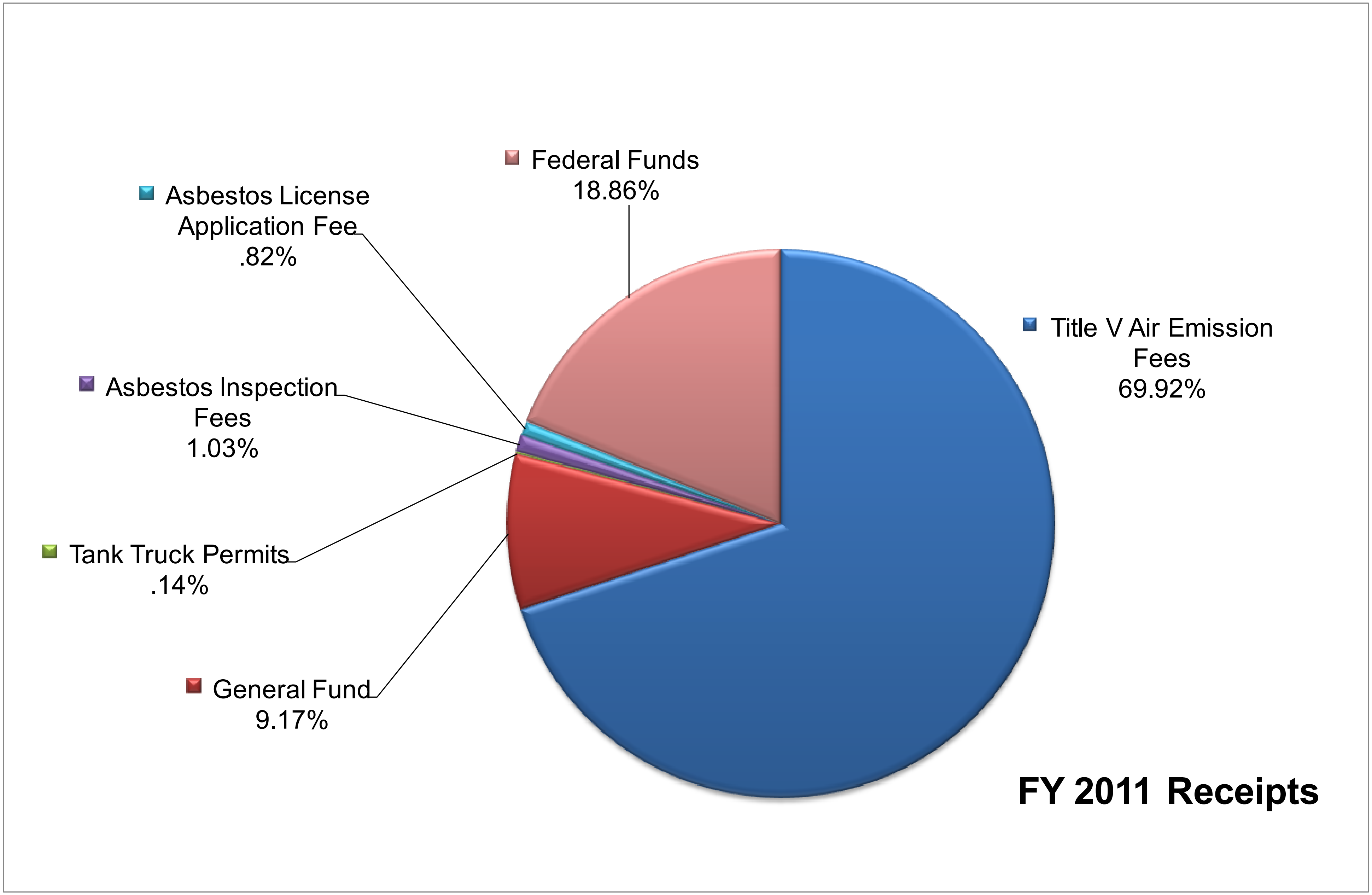


Figure 23: DAQ Fiscal Year 2011 Receipts. The division operates primarily on Title V emission fees and federal grant funds. Other funds are derived from tank truck fees, asbestos inspection fees, and general fund dollars.

A smaller portion of the agency's funding comes from direct fees used to offset the cost of specific agency activities. The agency collects a fee for the issuance of gasoline tank truck stickers, to ensure that gasoline delivery tanks meet vapor tightness and do not leak harmful gasoline vapors. Asbestos fees are assessed for the review of asbestos abatement plans in our schools and to certify and accredit asbestos contractors and professionals who remove asbestos in the state. A breakdown of the division's revenue for FY 2011 is provided in Figure 23.

During FY 2011 the Division for Air Quality faced a substantial funding shortfall. We lost 12 of our 175 full time cap positions due to a loss of revenues in two of our major funding sources. For the first time since the beginning of the Title V program we are raising the Title V emission fees above the federal presumptive amount for fiscal year 2012 in order to meet costs associated with maintaining the program. In addition, we have forgone our FY 2011 federal 105 grant fund due to not being able to meet our Maintenance of Effort obligations. The division did not make any capital outlay purchases in FY 2011. Due to budget restraints we were not able to purchase budgeted replacement vehicles, new and replacement air monitoring equipment, or upgrade existing computers. Staff have taken on additional duties to continue to ensure that state and federal program mandates are met, while enduring six mandated furlough days in FY 2011. We have continued to maintain our level of customer service and ensure that the integrity of the air pollution control program in Kentucky is not compromised.

Emissions Inventory

The ambient air monitoring program is designed to measure the quality of the air our citizens breathe, and use it to gauge whether that air meets the federal standards. The emissions inventory systems are designed to document and track actual and potential air pollutant emissions. These data are then used to develop air quality improvement programs when necessary.

"DAQ receives inventory emission data at the beginning of each calendar year, and it takes approximately nine months to verify and complete the inventory. For 2010, 1186 facilities were surveyed using the on-line web survey system."

-Melissa Duff,
Emissions Inventory Supervisor

In its most basic form, an emissions inventory is a list of sources of air pollutants, and for each source, or source type, the amount of each pollutant emitted, or has the potential to be emitted. Kentucky's emissions inventory is maintained in three parts:

• The **point source inventory** includes all actual and potential emissions from industrial sources at fixed locations;

• The **area source inventory** includes information on other pollution causing activities in a given area and documents the contribution of emissions from numerous small entities, or human activities. These include activities such as home heating, small print shops, agricultural activities, structure fires, road striping, and consumer products consumption;

• The third sector of the emissions inventory includes information on **emissions from mobile sources**. This sector is then broken down even further by estimating the contributions by on-highway vehicles and off-highway mobile sources such as construction equipment, lawn equipment, airplanes and locomotives.

The point source emissions inventory is performed and maintained by the Emissions Inventory Section. The main function of this section is to continue to improve the comprehensiveness and accuracy of point source emissions information and ensure the information is up to date and useable by the Administration Section for billing calculations; the Program Evaluation Section for developing and evaluating control programs; and the Permit Review Branch for permitting additional large sources within a given geographic area.

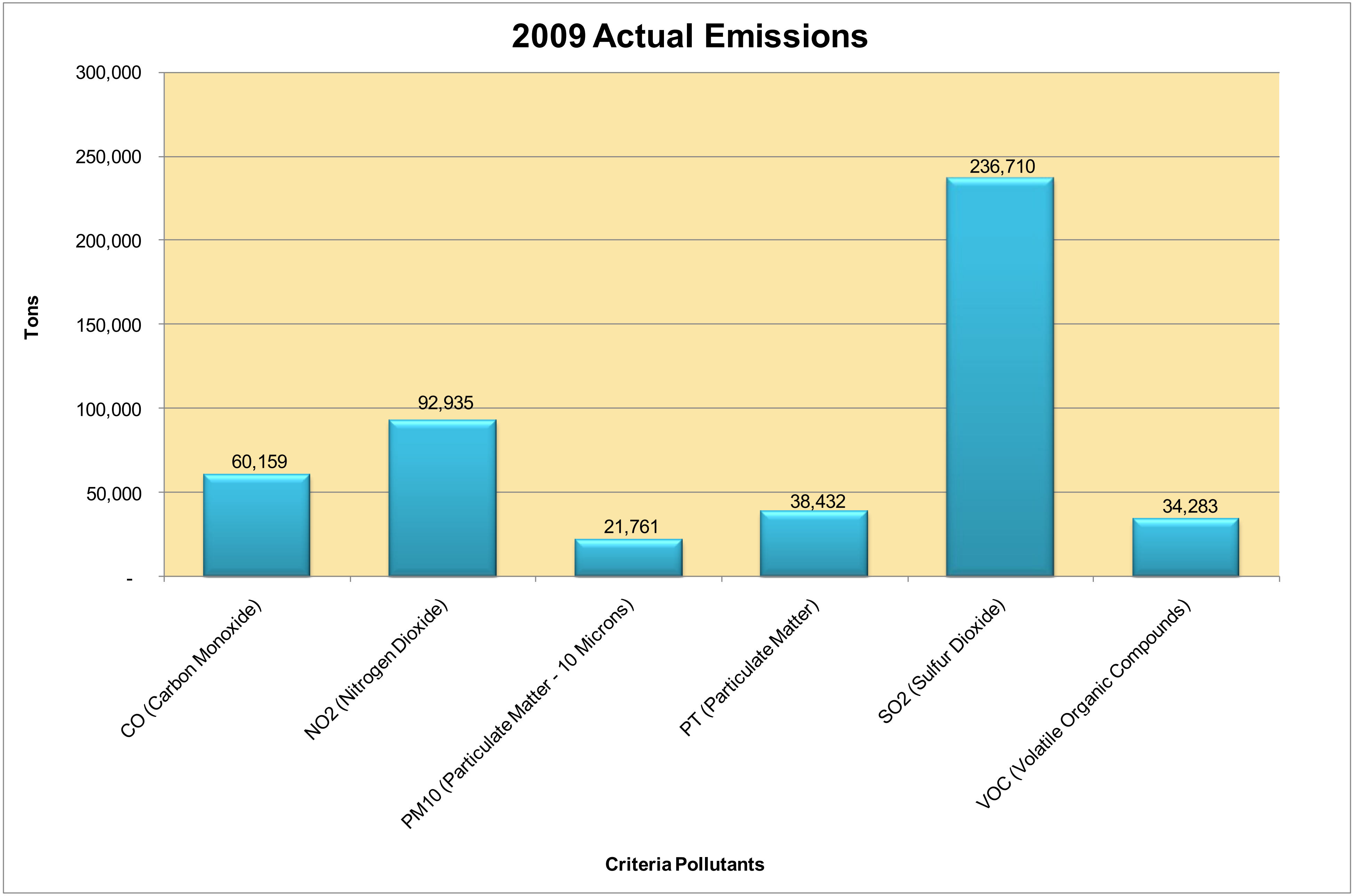


Figure 24: Actual tons of pollutants emitted by surveyed, regulated entities in Kentucky for the calendar year 2009. DAQ receives inventory emission data at the beginning of each calendar year; it takes approximately nine months to verify and complete the inventory.

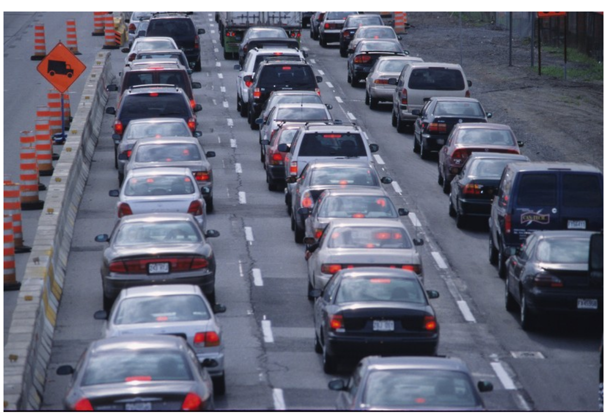
As mentioned previously, point sources in Kentucky are surveyed annually to determine actual air pollutant emissions for the previous year (Figure 24). This process begins in January and continues through October. The emissions inventory section surveys nearly 1200 plants per year using the following survey criteria to determine the sources that are surveyed in the state:

- Any major source (potential to emit 100 tons or more of a criteria pollutant – criteria pollutants are CO, NO_2, PM, SO_2, and VOC as a precursor for ozone);
- Any conditional major source (a source that has taken permitted limits to keep it below the 100 tons potential noted above);
- Any source subject to a federal regulation such as a New Source Performance Standard (NSPS), National Emissions Standards for Hazardous Air Pollutants (NESHAP), or Maximum Achievable Control Technology (MACT) for hazardous air pollutants;
- Sources of Nitrogen Dioxide (NO_2) or Volatile Organic Compounds (VOCs) greater than 25 tons in areas of the state not meeting the federal ozone standards or that had previously been designated as not meeting those standards. (Boone, Boyd, Campbell, Christian, Daviess, Edmonson, Fayette, Greenup, Hancock, Kenton, Livingston, Marshall, or Scott);
- All sources where the actual or potential emissions of an individual hazardous air pollutant is equal to or greater than 10 tons per year; and
- All sources where the actual or potential emissions of combined hazardous air pollutants are equal to or greater than 25 tons per year.

The responsibility for assembling the other portions of the emission inventory for specific areas falls to the Evaluation Section.

These inventories are typically performed for areas that are not meeting a federal air quality standard for a particular pollutant or when a control program has been put in place for a particular pollutant and the overall effectiveness of that control program is being evaluated.

For area sources (those smaller businesses or human activities) typically federally supplied emissions factors are used and adjusted based on population data for a given area.



For mobile source related emissions, mathematical models are used to determine emissions contributions. For on-road mobile emissions, data gathered by the Kentucky Transportation Cabinet is used to determine “vehicle miles traveled” for a given area. This information is used in conjunction with any mobile controls, such as fuel programs, or gasoline pump controls to determine the mobile source contribution in an area. For off-highway mobile emissions such as airplanes, another mathematical model is used, with flight landing and take-off data used to calculate emissions.

Regulation Development

The Regulation Development Section drafts and adopts regulations to control air pollution in the state. This section is responsible for reviewing federally adopted regulations and recommending whether or not to adopt and/or request delegation of those regulations in Kentucky.

Regulations can either be drafted in response to:
- Federal mandates to control air pollution or specific air pollution sources;
- A state mandate made by either the governor or the legislature to control air pollution within the Commonwealth; or

- An action identified by the cabinet as necessary to protect human health and the environment.

Regulations can be adopted for specific controls to address specific air quality concerns within the state. While the agency receives its authority to draft and adopt air quality regulations under KRS Chapter 224, it is also governed on the drafting of those regulations by KRS 13A, which specifies regulatory drafting procedures as well as public participation in the regulatory promulgation process.

After the need for a new regulation or a regulatory amendment has been identified, it becomes the responsibility of the Regulation Development Section to compile all input and policy decisions into a regulatory draft and guide the process through promulgation. The promulgation process could include gaining inter-agency and EPA input into the regulation content, advertising the regulation or regulatory amendment for public comment, responding to those comments and making any subsequent changes found necessary, and tracking the regulation through final legislative approval.

Several regulations were adopted or revised in Kentucky from July 2010 through June 2011:

<u>401 KAR 59:015, New Indirect Heat Exchangers</u>

This administrative regulation establishes standards of performance for new indirect heat exchangers with heat input capacity between one (1) and 250 million BTU per hour. The amendment, which became effective on October 7, 2010, gives owners or operators of indirect heat exchanges additional flexibility to meet the monitoring requirements by allowing the use of an alternative method for determining a source's allowable emission rate.

<u>401 KAR 51:001, Definitions for 401 KAR Chapter 51; 52:001, Definitions for 401 KAR Chapter 52</u>

On January 2, 2011, the first phase of EPA's new Tailoring Rule went into effect. The Tailoring Rule was created to address greenhouse gas (GHG) permitting requirements for major facilities. The goal of the Tailoring Rule was to "tailor" the thresholds that apply to GHGs in air quality permits, raising those limits to 75,000 and 100,000 tons per year so that only the largest emitters of GHGs would be required to obtain air permits due to their GHG emissions.

As a result of the Tailoring Rule, amendments to these regulations became effective at both the state and federal level on January 3, 2011, and adopted into the Kentucky SIP. These amendments included the revision or introduction of three federal definitions that are pertinent to Kentucky's permitting programs by establishing emission thresholds for GHGs. The amended definitions included "Regulated NSR pollutant", which includes GHGs as a regulated NSR pollutant per the Clean Air Act; "Major source", which includes sources that emit air pollutants subject to regulation; and the phrase "Subject to regulation", which includes the GHG emission thresholds to trigger PSD and Title V permitting. The Tailoring Rule established January 2, 2011, as the effective date for this regulation of GHGs and required states to adopt the rule and meet this deadline or face possible construction bans or loss of permitting authority.

<u>401 KAR 51:052, Review of new sources in or impacting upon non-attainment areas</u>.

DAQ filed an amendment to 401 KAR 51:052 on March 14, 2011. The previous regulation only allowed for emission offset credits if a permit application is received before the source shutdown or curtailment of another facility. The amendment allows emissions resulting from shutdown or curtailment to be eligible for offset credits whether a permit application is submitted before or after the closure or curtailment. The public hearing for the Ordinary amendment (which will replace the Emergency amendment) was held on April 26, 2011, and an Amended After Comments version was filed on June 9, 2011.

Boiler MACT for Major and Area Sources

In June of 2010, the EPA proposed two National Emission Standards for Hazardous Air Pollutants (NESHAPs) for commercial, industrial, and institutional boilers located at major and area sources. These rules would establish emissions limitations and standards for boilers and process heaters. The rules were finalized on March 21, 2011; however, on May 18, 2011, EPA published a delay for the effective date for the major source rule until the EPA completes a reconsideration process for the rule. The area sources rule became effective May 20, 2011, and DAQ has been working to distribute information to applicable facilities.

State Implementation Plan

The State Implementation Plan (SIP) is a federally mandated plan to ensure attainment and maintenance of the various National Ambient Air Quality Standards (NAAQS) within a state or region. Once regulations or programs are adopted into the SIP, they become federally enforceable. This means that if for some reason a state cannot or will not enforce the regulations included in a respective SIP, the EPA can step in and enforce those provisions.

Overall, the framework and components of the SIP are designed to ensure that states continue to move forward in achieving air quality that meets the national standards, and once achieved, that air quality continues to maintain those standards. In short, the SIP is the mechanism for air resource management. Air resource management begins with:

"The EPA is in the process of making an official determination that the three areas in Kentucky that are classified as nonattainment for the 1997 annual PM 2.5 standard have attained the standard. EPA is currently revising the national air quality standard for ozone, and has recently revised standards for lead, sulfur dioxide, and nitrogen dioxide. Additional rules promulgated by the EPA, such as the just released Cross-State Air Pollution Rule, will continue to reduce pollution levels in the state."

John Gowins,
Evaluation Supervisor

- A determination of existing conditions – air quality, meteorological conditions, and an inventory of emissions;
- Development of goals or objectives for an area (typically air quality standards that must be met or maintained); and
- Development of control strategies that may include emission reduction measures or measures to ensure no further degradation of air quality occurs.

A key component of air resource management, or SIP development, is coordination with the local communities who have a stake in how a plan is to be implemented.

Ozone

For the first time since the 1997 8-hour ozone standard was promulgated, all counties are meeting the national standard for ground-level ozone pollution, a significant achievement for the Commonwealth.

Ground-level ozone is a secondary, man-made pollutant and is the primary component of smog. Secondary pollutants are not emitted directly from a stack, but rather are formed when two primary pollutants mix in the atmosphere. In this case, ground-level ozone is formed when volatile organic compounds (VOCs) and nitrogen oxides (NO_x) combine in the presence of heat and strong sunlight. This makes ozone a summertime pollutant.

In 2004, the EPA designated areas as not meeting (in nonattainment of) the 1997 8-hour ozone NAAQS. These designations were based on 2001, 2002, and 2003 monitoring data and were the first designations made under the 1997 standard. Effective June 2004, Boone, Boyd, Bullitt, Campbell, Christian, Jefferson, Kenton, and Oldham counties were designated as not meeting this standard. By 2005, monitoring data showed that several Kentucky counties came back into compliance with the 8-hour ozone standard. Kentucky requested that the EPA re-designate those areas as meeting the 1997 standard, and the EPA redesignated Boyd, Bullitt, Christian, Jefferson, and Oldham counties as in attainment (compliance) with the standard. The plans submitted to the EPA, with the request to re-designate those counties, documented that the areas should continue to have emission levels that would allow them to remain in compliance. On August 5, 2010, the EPA finalized the redesignation of Boone, Kenton, and Campbell counties as meeting the 1997 8-hour ozone standard.

Ozone damage on milkweed leaf. The black stippling characteristic of ozone damage is found only on the upper leaf surface, and never crosses the veins. Photo: National Park Service.

Nevertheless, EPA is in the process of significantly strengthening the NAAQS for ground-level ozone to better protect public health and the environment. On January 6, 2010, the EPA began taking comments on a primary 8-hour ozone standard in the range of 0.060 – 0.070 ppm and a secondary standard in the range of 7-15 ppm-hours. These primary standards use three years of monitoring data and the 4th highest recorded 8-hour average to determine compliance. At the time of publication of this report, the final rule was not final.

Fine Particulate Matter

In addition to Kentucky's great news about reduced ozone levels across the state, the EPA has confirmed that all Kentucky counties continue to meet the requirements of the 2006 daily fine particle standard.

There are actually two standards set for fine particulate matter. In addition to the 24-hour average, there is a 1997 standard for an annual average, set at 15 ug/m, which was not changed in 2006.

In June 2008 the division submitted an attainment demonstration that relied on projected changes from the court-remanded Clean Air Interstate Rule (CAIR). DAQ has monitored compliance with this standard in Kentucky for the years 2007-2010. On January 27, 2011, the division requested redesignation of the Cincinnati-Hamilton PM 2.5 Nonattainment Area which includes the Northern Kentucky Counties of Boone, Campbell, and Kenton. DAQ is currently developing redesignation requests for the two remaining nonattainment areas in the state, the Louisville area and the Huntington Ashland area. It is uncertain at what point EPA will approve these submittals. As of publication of this report, the EPA has finalized CAIR's replacement, the Cross State Air Pollution Rule (CSAPR). The Cross-State Air Pollution Rule requires 28 states in the eastern half of the United States to significantly improve air quality by reducing power plant emissions that cross state lines and contribute to ground-level ozone and fine particle pollution in other states. This action builds on more than fifteen years of progress in implementing Clean Air Act reductions of sulfur dioxide (SO_2) and nitrogen oxides (NO_X).

Nitrogen Dioxide

On January 22, 2010, the EPA strengthened the standard for nitrogen dioxide (NO_2). The new standard is set at a 1-hour level of 100 parts per billion (ppb). This level will protect against the health effects associated with short-term exposure of NO_2. The standard is based on a 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations. The EPA is also keeping the current annual average standard for NO_2 at 53 ppb.

On January 11, 2011, the division submitted a letter to EPA recommending that the areas in the state which have monitors be designated as attainment, and the rest of the state be designated as attainment/unclassifiable. In a letter dated June 28, 2011, EPA concurred with the division's recommendations.

The EPA is establishing new ambient air monitoring and reporting requirements for NO_2. These requirements will require a shift in the division's current monitoring network. For example, monitors will now be required near major roads in urban areas, where currently there are no monitors in these areas. The Program Planning and Administration Branch and the Technical Services Branch are working together to address these new requirements. The division has determined that one new monitor will be required in the Northern Kentucky area, and other expenditures will be required as the monitoring network is shifted to accommodate the new NO_2 standards. The new monitor must be operational by January 2013. Once the monitoring system is in place, the state will likely have to reevaluate the areas and modify the recommendations if necessary.

Sulfur Dioxide

On June 22, 2010, the EPA strengthened the NAAQS for sulfur dioxide (SO_2). This standard has not been changed since 1971 and the EPA was required under a judicial consent decree to review the primary standard. On July 13, 2011, the EPA announced the proposed secondary standard which addresses public welfare. The rule has not yet been published.

The 2010 primary standard, similar to the NO_2 standard, is a 1-hour standard of 75 ppb. This new standard will protect public health by reducing exposure to high short-term levels of SO_2. The standard is based on the 3-year average of the 99th percentile of the annual distribution of the daily maximum 1-hour average concentrations. The EPA revoked the two existing 1971 primary standards of 140 ppb evaluated over 24 hours, and the annual standard of 30 ppb, because the 2010 standard is more stringent than the older standard and current health evidence indicated little association between long-term exposure to SO_2 and health effects. On June 2, 2011, the division submitted a letter to EPA recommending that Jefferson County be designated as nonattainment, and the rest of the state as attainment. As in the NO_2 rule, the new SO_2 rule will require the division to site new monitors and make other network adjustments by January 1, 2013. DAQ has determined that an SO_2 monitor will be required in Christian County as a result of the new standard.

Lead

The EPA revised the NAAQS for lead to 0.15 $\mu g/m^3$ in November of 2008, and simultaneously established the current monitoring threshold for lead of 1.0 tpy. However, before monitors were put in place to comply with this new monitoring threshold by the state, the EPA issued a proposal to lower the monitoring threshold for lead to 0.5 tpy. This proposal was issued December 23, 2009, but has not yet been made final. Air quality monitoring agencies would use this threshold to determine if an air quality monitor is required to be placed near a facility emitting lead.

The EPA also requested comments on alternative emission thresholds. The current emissions threshold for lead is 1.0 tpy, and three monitors in Kentucky began collecting data in 2010 at facilities emitting lead at that level. The EPA has not finalized recommendations for lead designations due to the lack of available monitoring data. On October 5, 2009, the division submitted a letter to the EPA indicating that we did not have sufficient data to determine designations for lead. DAQ made a recommendation of "unclassifiable" with a request that EPA extend the deadline up to one year for issuing designations due to insufficient information. By letter dated June 14, 2011, EPA proposed adopting Kentucky's recommended designations for all counties.

Visibility

Regional haze is pollution that impairs visibility over a large region, including national parks, forests, and wilderness areas (many termed "Class I" areas). An easily understood measure of visibility to most people is visual range. Visual range is the greatest distance, in kilometers or miles, at which a dark object can be viewed against the sky. As part of the Clean Air Act Amendments and further regulations adopted by the EPA, states must develop plans to restore natural visibility conditions in the 156 Class I areas throughout the nation by the year 2064. Kentucky's Mammoth Cave National Park is included in the list of areas.

Regional haze is typically caused by sources and activities emitting fine particles and their precursors, often transported over large regions. Particles affect visibility through the scattering and absorption of light. Reducing fine particles in the atmosphere is an effective method of improving visibility.

Hazy (left photo, visibility range less than 10 miles) and clear (right photo, visibility range less than 190 miles) days at Mammoth Cave National Park. Photos: National Park Service Air Resources Division, Denver, CO.

As federally required, DAQ submitted Kentucky's draft plan to the Federal Land Managers and the EPA for review in December 2007. After receiving comments on the draft document and making necessary revisions, the division posted the proposed plan for public comment and submitted it to EPA in March 2008. After addressing comments received during the public comment period in the statement of consideration, the division submitted for approval the final Kentucky Regional Haze SIP to the EPA in June 2008. In May 2010, the division also submitted to EPA a formal SIP revision to amend the June 2008 Regional Haze SIP on two technical issues.

Both the 2008 SIP package and its 2010 revision remain under review by the EPA. The reason for this is that Kentucky's regional haze SIP is based on emission reductions specified by EPA's Clean Air Interstate Rule (CAIR). CAIR was remanded without vacature by the D.C. Circuit Court in December 2008, for failing to adequately address interstate transport of pollutants. Thus, EPA has not taken final action on any states' regional haze SIPs to date. Nevertheless, EPA is now under a consent decree agreement with the Sierra Club to take final action on Kentucky's Regional Haze SIP on or before March 15, 2012. As of the publication of this report, EPA has finalized the Cross State Air Pollution Rule (CSAPR), which replaces CAIR. The division is currently reviewing the newly promulgated CSAPR regulation to determine the effect on Kentucky's regulations regarding CAIR, CAIR-based conditions on existing permits, and revisions to Kentucky's SIP.

TECHNICAL SERVICES

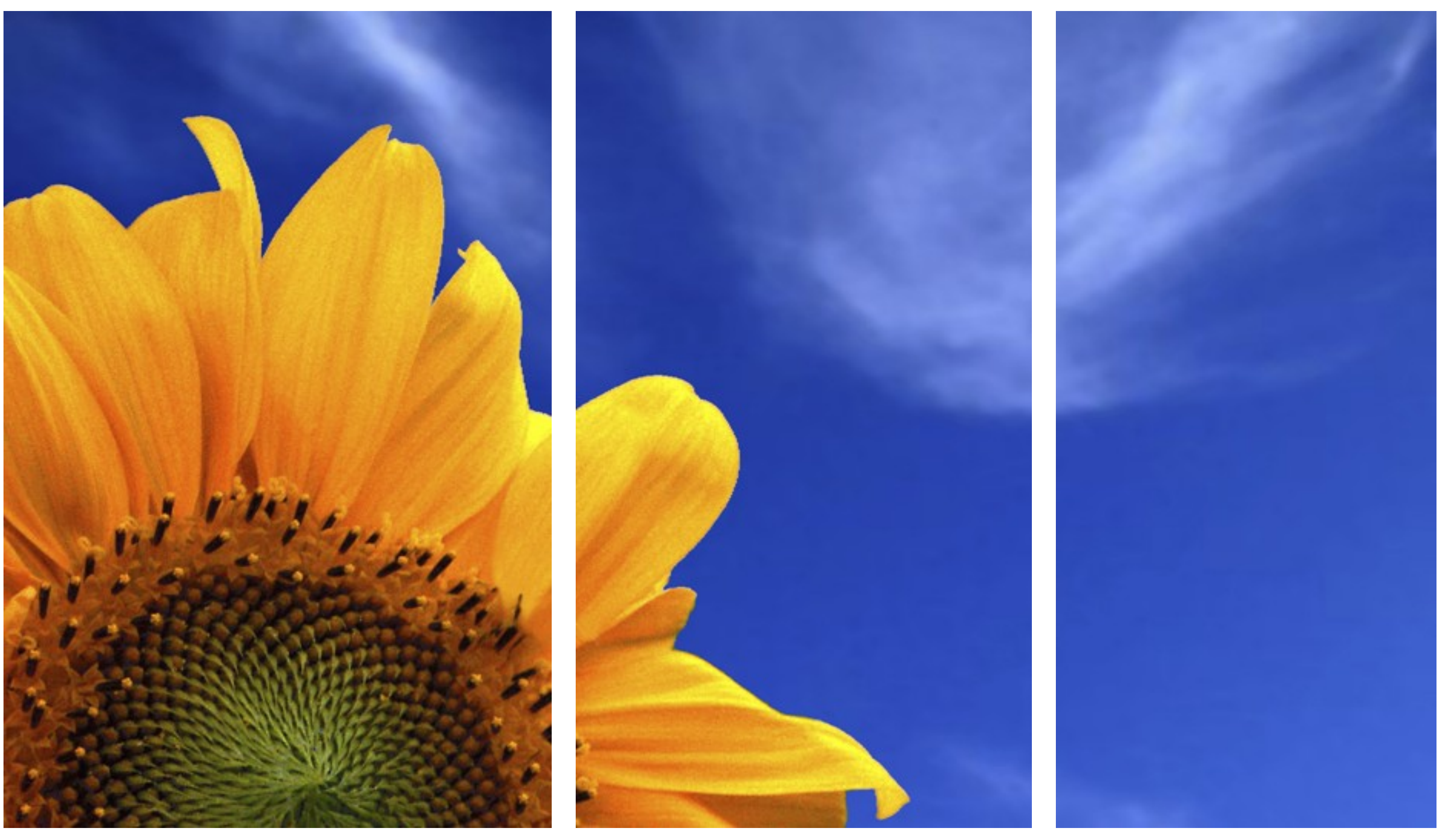
Since July 1967, the Technical Services Branch (TSB) has operated an air quality monitoring network. The 2010 network included 42 monitoring stations in 28 counties (this total includes monitors operated by the Louisville Metro Air Pollution Control District (LMAPCD) and the National Park Service (NPS) at Mammoth Cave).

The monitoring station locations are selected in accordance with EPA regulations (40 CFR 58, Appendix D) and, in general, are established near high population areas or air pollution sources. Each year the site locations are reviewed to ensure that adequate coverage is being provided and regulatory requirements are met.

Many staff hours are devoted to the operation of the monitoring network. Division staff routinely visit our sites to calibrate and maintain the monitoring equipment, collect samples, and verify and document data from the continuous monitors. Because it is imperative that the air monitoring data be accurate and precise, the Division for Air Quality has an extensive quality assurance program. Staff members audit every air monitor quarterly to ensure that each is operating properly. This audit process includes monitors operated by the LMAPCD, the NPS, and industrial networks.

Monitoring data is used in several ways. The data is utilized to demonstrate compliance with, or progress made toward meeting, ambient air quality standards and to identify pollution trends. The data also assists in evaluating public health impacts and the possible need to initiate emergency control procedures.

The public has access to the monitoring data on a daily basis through the Air Quality Index (AQI) on our website (air.ky.gov) or toll free (1-800-AIR-IN-KY). The AQI is a 24-hour report on Kentucky's air quality. The public can access daily ozone and particulate matter reports through EPA's AIRNOW website at www.epa.gov/airnow.



Prior to 2008, the TSB published information about the ambient air monitoring network separately in the Surveillance Network Report. However, since 2008, detailed monitoring information has been published annually via this report.

In addition to operating the division's ambient air monitoring network, the Technical Services Branch (TSB) is also responsible for ensuring that facilities demonstrate compliance through the review and observation of source stack tests.

TSB is staffed by employees that include managers, supervisors, administrative staff, technicians, and engineers. The branch is comprised of three specialized sections: Quality Assurance, Technical Support, and Source Sampling.

Source Sampling Section

The Source Sampling Section provides technical guidance to the division and facilities through the review of compliance and Relative Accuracy Test Audit (RATA) test protocol forms, observation of compliance and RATA tests, and technical review of compliance and RATA test reports. The Source Sampling Section ensures approved EPA test methods are used and proper engineering principles are followed for source tests throughout the Commonwealth. A facility may be required to test their emissions at a source based on regulation, permit requirements, or upon a division request.

Quality Assurance Section

The Quality Assurance Section conducts performance and systems audits of all air monitoring stations within Kentucky's air monitoring network, as well as five industrial sites within Kentucky. The section is responsible for validating all data generated from the air monitors located throughout the state's network. Data audits ensure that all data is in compliance with the state and federal monitoring regulations, particularly 40 CFR Part 58, Appendix A. The section is also responsible for certifying all equipment used within the network.

Technical Support Section

The Technical Support Section repairs, modifies, and maintains instrumentation and equipment associated with the Kentucky air monitoring network, which includes continuously operating monitors for particulates, sulfur dioxide, oxides of nitrogen, ozone, and mercury, as well as intermittent particulate and air toxic samplers. The section also maintains a statewide computerized data acquisition network that automatically retrieves air monitoring data and makes information available to the public in the form of an Air Quality Index, which is regularly posted on the division's website. They also maintain a $PM_{2.5}$ weigh-lab operation which has the responsibility of handling and conditioning sample filters, weighing $PM_{2.5}$ filters, and reporting the analytical results.

Compliance and RATA Tests

Facilities throughout the Commonwealth are required by federal regulations, state regulations, permits, and/or division-directives to sample the emissions being released from identified point sources. Samples must be collected and analyzed in accordance with federally promulgated test procedures and methods, as referenced in:

- 40 CFR Part 51 - Requirements for Preparation, Adoption, and Submittal of Implementation Plans;
- 40 CFR Part 60 - Standards of Performance for New Stationary Sources;
- 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants;
- 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories; and
- 40 CFR Part 75 - Continuous Emission Monitoring.

In general, a source test consists of three sample runs that are averaged together for a single test result. A sample run can last between one and 24 hours, depending upon the facility's production operations. Prior to a test, a facility is required to submit a test protocol explaining the methods and procedures that will occur during the source test. The Source Sampling Section reviews the test protocol prior to the test to ensure proper procedures and methods will be followed. The Source Sampling Section also makes every effort to observe scheduled source tests throughout the Commonwealth. Following a test, a report is submitted to the division where it is reviewed for accuracy and completeness. The compliance status of the facility is also determined.

In 2010, the Source Sampling Section received 298 Compliance and RATA test protocols by Kentucky facilities; 245 tests were scheduled. The section observed 78% of the scheduled compliance tests and 38% of the scheduled RATA tests in 2010. The Source Sampling Section also received 230 test reports and has 80% of the technical reviews of those reports completed.

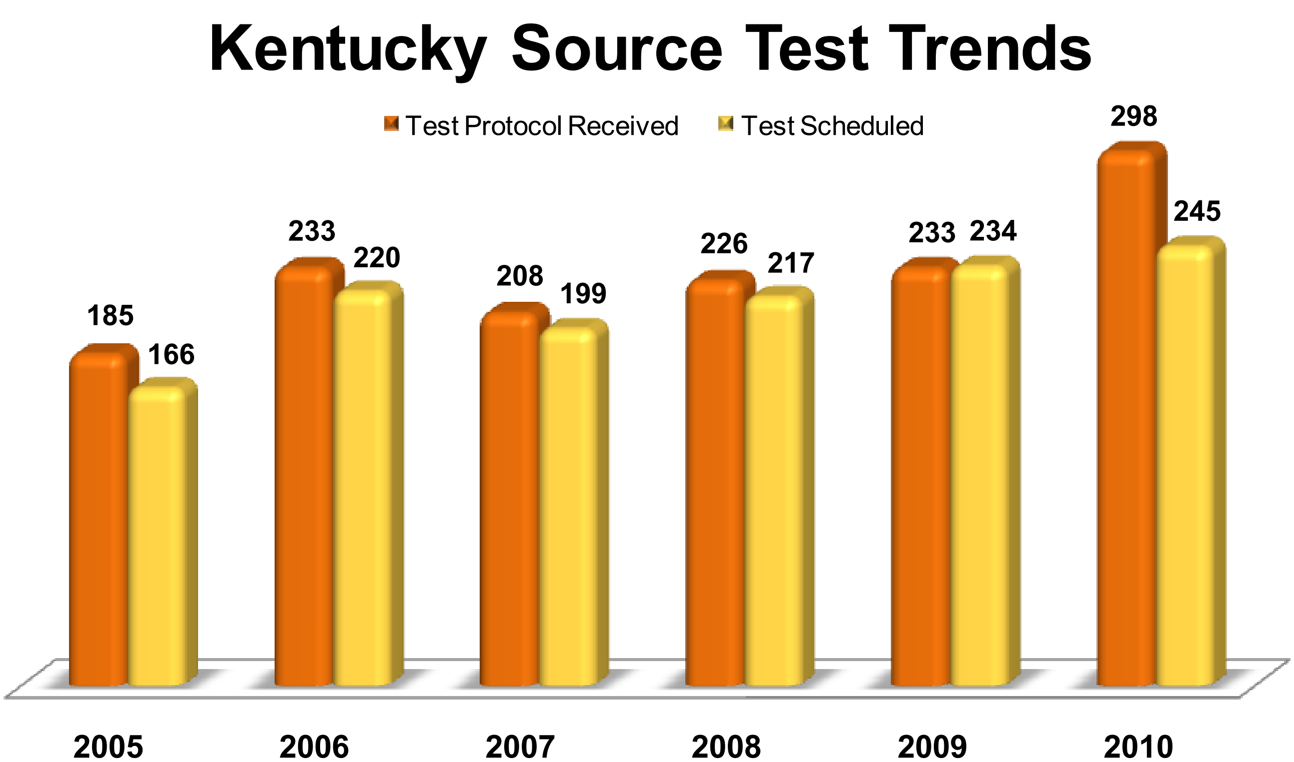


Figure 25: The last six years have shown an increase in source testing throughout the state.

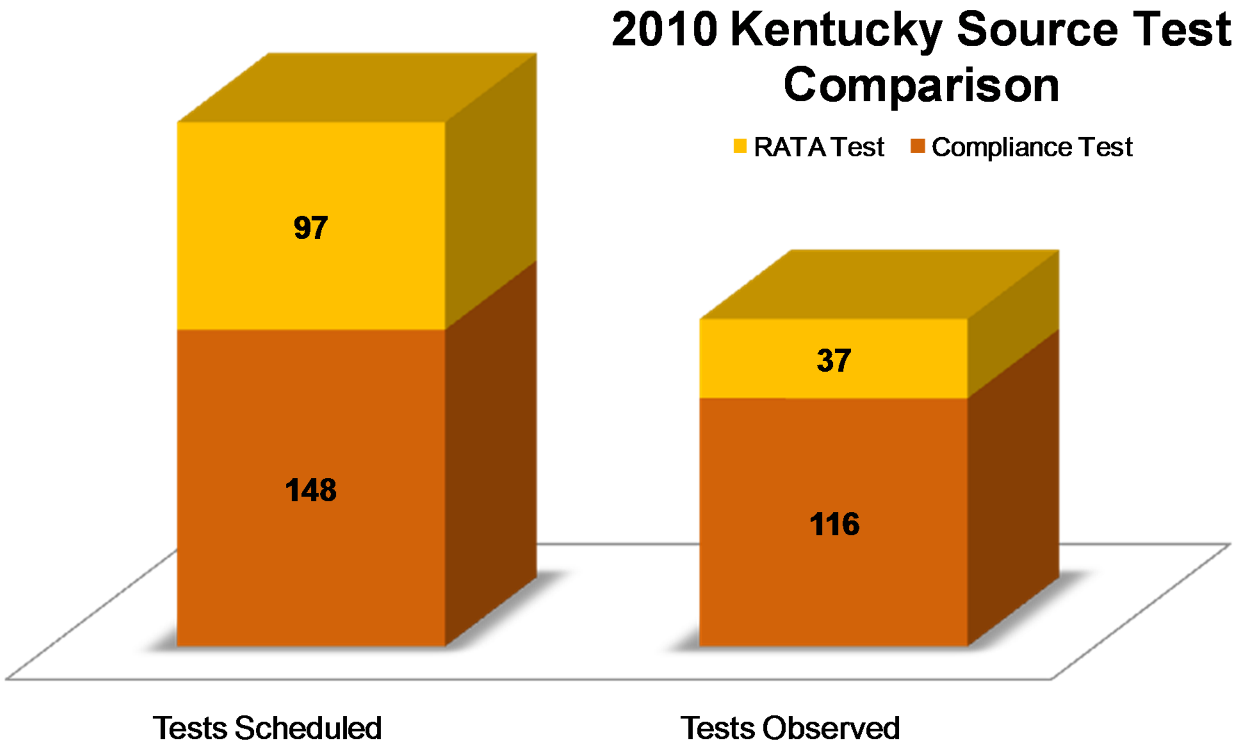


Figure 26: The Source Sampling Section observed 78% of the scheduled compliance tests and 38% of the scheduled RATA tests in 2010.

Ambient Air Monitoring Network

According to federal regulation (40 CFR Part 58, Appendix D), the ambient air monitoring network must be designed to meet three basic air monitoring objectives:

- The network must provide air pollution data to the general public in a timely manner.
- The network must support compliance with ambient air quality standards and emissions strategy development.
- The network must support air pollution research studies.

In order to meet these three basic monitoring objectives, the network must be designed with a variety of types of monitoring sites. In essence, the network design must be capable of illustrating the peak air pollution levels, typical levels in populated areas, air pollution transported into and out-side of a city or region, and air pollution levels near specific emissions sources.

In 2010, TSB completed two extensive documents that detail Kentucky's air monitoring network in these terms. The Kentucky Ambient Air Monitoring Network Plan and the Kentucky Ambient Air Monitoring Five-Year Network Assessment describe the network in terms of scales of representa-tiveness and specific designations (e.g., monitors sited for source impacts, regional transport, background, and so forth). The Ambient Air Monitoring Network Plan is available for review on the division's website at http://air.ky.gov/Pages/DivisionReports.aspx

In September 2010, the TSB hosted a three-day Ambient Air Monitoring workshop, which brought all state personnel involved with the ambient air monitoring network, as well as representatives from the U.S. EPA, National Park Service, and local industry, together for training.

Pages 57-102 of this annual report contain tables and graphs that summarize the concentrations of pollutants measured in Kentucky during the calendar 2010 year, as well as summary statistics for the 2008-2010 design value time period. A design value is the most recent three years of data from which an average is calculated to determine compliance with the NAAQS in question. Maps of each pollutant network are representative of the air monitoring network, as submitted to the EPA in the 2010 Ambient Air Monitoring Network Plan. Regulations require that annual network plans be representative of a fiscal year (July-June); however, attainment decisions are typically based upon the data available within a calendar year (January-December).

It's important to note that an *exceedance* of a particular pollutant is not the same as a *violation* of the NAAQS for that pollutant. Violations are determined according to the formula for each standard and involve the average of multiple measured values over a specified amount of time.

Any data contained in this report is subject to change. The most current quality assured dataset can be obtained through a Kentucky Open Records Act (KORA) request to the TSB.

Data Quality Assurance

TSB quality-assures and validates all ambient data collected by the monitors and samplers in the network. Upon completing its review of 2010 data, the division submitted its annual data certification request to EPA prior to the May 1 regulatory deadline. This data certification package includes reports that summarize all the hours of valid data collected, as well as the quality control measures taken to ensure the accuracy of that data, and the number of annual performance evaluations completed. The information obtained in the annual data certification request is available to the public through KORA requests.

TSB maintains a library of Quality Assurance Project Plans (QAPPs) and Standard Operating Procedures (SOPs) for each instrument operated in the monitoring network. There are four active and current QAPPs. There are also 25 SOPs in the DAQ library, several of which are under currently revision.

In 2010, personnel within the TSB conducted a total of 357 performance audits of the division's air monitoring equipment. Performance audits were also conducted on monitors operated by Mammoth Cave National Park, Louisville Metro Air Pollution Control District, and the University of Louisville, as well as for monitors operated by local industry. Such audits are crucial to ensuring data quality and verifying instrument function. Additionally, a total of 30 technical systems audits were performed to ensure that operational procedures at each site were followed.

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

Figure 27: Understanding the Air Quality Index (AQI). The purpose of the AQI is to help you understand what local air quality means to your health.

The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. The EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health.

How does the AQI work?

Think of the AQI as a yardstick that runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while a value over 300 signifies hazardous air quality.

An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy; at first for certain sensitive groups of people, then for everyone as AQI values get higher.

Where can I find out about the AQI?

The Division for Air Quality reports nearly real-time AQI values on our website, at air.ky.gov, and via a toll-free telephone number, 1-800-AIR-IN-KY. Forecasted AQI data can be viewed at EPA's website, www.airnow.gov. Forecasted AQI data is generated using a combination of forecasted weather data and known pollution emission values. DAQ does not forecast for air pollution. In Kentucky, the Louisville Air Pollution Control District forecasts due to its population size as required by the CAA.

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

POLLUTANT	MAXIMUM CONCENTRATION	
	Primary Standard	Secondary Standard
Carbon Monoxide		
8-Hour Average 1-Hour Average	9 ppm (1) 35 ppm (1)	None
Lead		
Rolling 3-Month Average	0.15 μg/m^3 (2)	Same as primary
Nitrogen Dioxide		
Annual Average 1-Hour Average	53 ppb (3) 100 ppb (4)	Same as primary
Particulate Matter (measured as PM_{10})		
24-Hour Average	150 μg/m^3 (5)	Same as primary
Particulate Matter (measured as $PM_{2.5}$)		
Annual Average 24-Hour Average	15.0 μg/m^3 (6) 35 μg/m^3 (7)	Same as primary
Ozone		
8-Hour Average	0.075 ppm (2008 std) (8) 0.08 ppm(3) (1997 std) (9)	Same as primary
Sulfur Oxides		
Annual Average 24-Hour Average 3-Hour Average 1-Hour Average	0.03 ppm (11) 0.14 ppm (1) (11) --------- 75 ppb (10)	--------- --------- 0.5 ppm (1) ---------

Figure 28: The National Ambient Air Quality Standard determines what levels of each pollutant are acceptable in terms of protecting human health (primary standard) and public welfare (secondary standard).

Understanding the National Ambient Air Quality Standard

The federal Clean Air Act (42 U.S.C. 7401-7671), as amended by the U.S. Congress in 1970, 1977 and 1990, directs the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards defining maximum allowable ambient (outdoor) concentrations for criteria pollutants. The term "criteria pollutants" derives from the requirement that EPA must set criteria or standards for each pollutant in the table at left.

There are two standard goal levels for each of the criteria pollutants. The Primary Standard is designed to protect the public health. The Secondary Standard is designed to protect public welfare. Welfare includes damage to plants and animals, impairment of visibility, and property damage.

Units of measure in the chart are micrograms of pollutants per cubic meter of air ($\mu g/m^3$), parts of pollutants per million (ppm) parts of air, and parts per billion (ppb) parts of air.

Footnotes:

(1) Not to be exceeded more than once per year.

(2) The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved (final rule signed October 15, 2008).

(3) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard

(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

(5) Not to be exceeded more than once per year on average over 3 years.

(6) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$.

(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).

(8) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).
(b) EPA is in the process of reconsidering these standards (set in March 2008). The 2008 standard has been stayed and the 1997 standard of 0.08 ppm is effective until a new standard is issued.

(9) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

(10) To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb (final rule signed June 22, 2010).

(11) Revoked June 22, 2010.

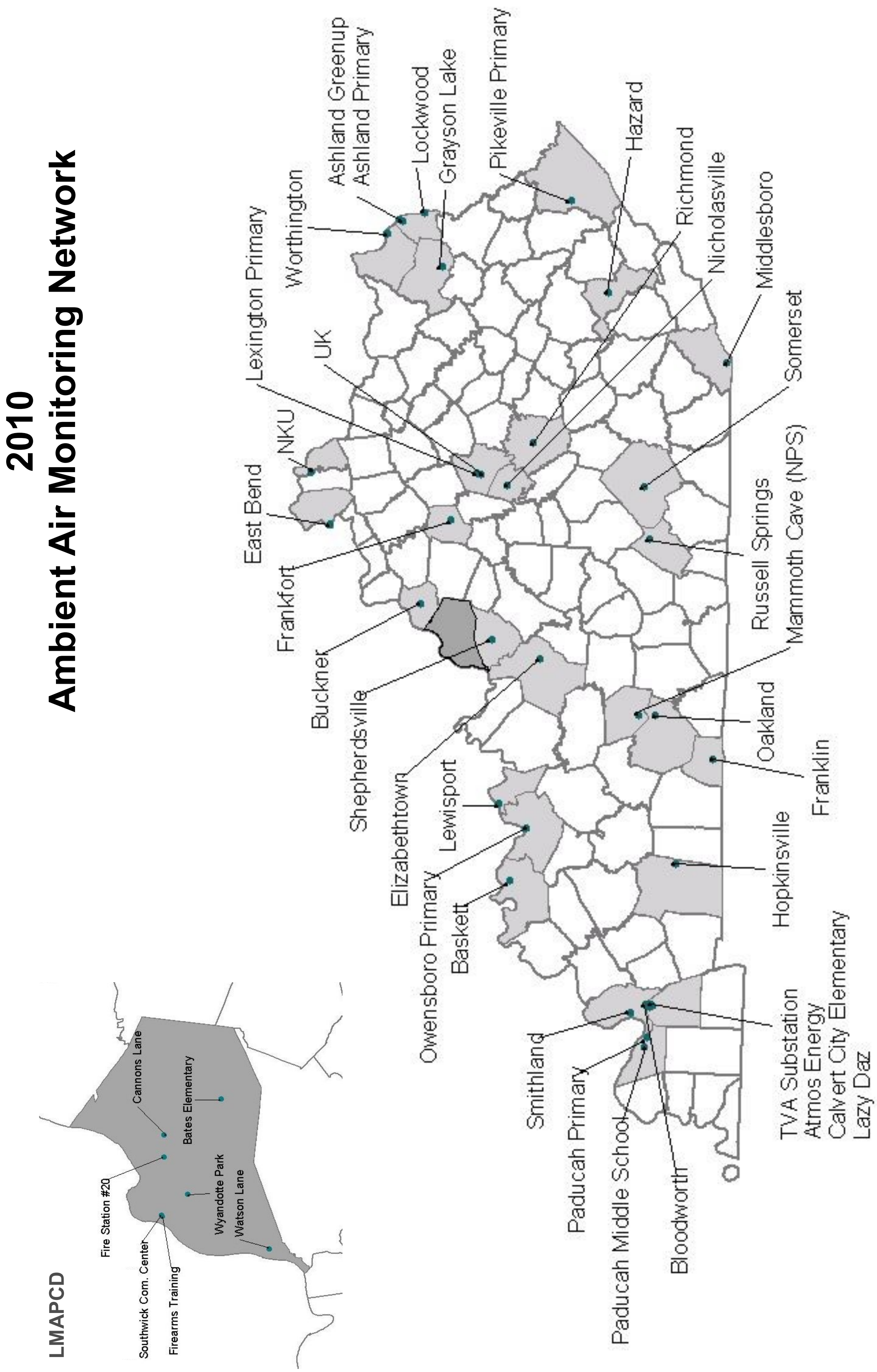


Figure 29: The Kentucky Division for Air Quality monitoring network. Inset shows the Louisville Metropolitan Air Pollution Control District monitoring network.

Air Monitoring Stations Summary

Metropolitan Statistical Area	Number of Sites	$PM_{2.5}$	PM_{10}	PM_{coarse}	SO_2	NO_2	NO_y	CO	O_3	Lead	Hg	Wet Dep	VOC	Carbo nyl	Speci ation	Met
Bowling Green, KY	2	4 C T	0	0	1	1	0	1	2	0	1	0	0	0	0	1
Cincinnati-Middletown, OH-KY-IN	2	2 T	0	0	1	1	0	0	2	0	1	1	0	0	0	1
Clarksville, TN-KY	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Elizabethtown, KY	1	3 T	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Evansville, IN-KY	1	2 T	1 **	0	1	0	0	0	1	0	0	0	0	0	0	0
Huntington-Ashland, WV-KY-OH	4	2 T	2 C**	0	2	1	0	0	2	1	0	0	1	1	1	1
Lexington-Fayette, KY	3	3 T	1 **	0	2	1	0	0	2	1	1	1	1	1	1	1
Louisville-Jefferson County, KY-IN	9	10 C T	4 C**	1	3	1	1	2	5	1	0	0	0	0	1	3
Owensboro, KY	2	2 C T	0	0	1	1	0	0	2	0	0	0	0	0	0	1
Micropolitan Statistical Area																
Paducah, KY-IL	4	2 T	1	0	2	1	0	0	2	0	1	0	1	0	0	1
Somerset, KY	1	1 T	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Middlesborough, KY	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Richmond-Berea, KY	1	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Frankfort, KY	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in a MSA																
Carter County	1	1	2 C	0	0	0	0	0	1	0	1	2	2	2	1	1
Marshall County	4	0	1 **	0	0	0	0	0	0	0	0	0	5	0	0	1
Perry County	1	1 T	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Pike County	1	3 T	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Russell County	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Simpson County	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTALS	42	40	12	1	13	7	1	3	27	6	5	4	10	4	4	14

C=Collocated monitors; D=Duplicate monitors; T= Continuous PM2.5 monitors or continuous PM10 monitors; **=Multiple analysis: PM10 Teflon filters used for PM10 monitoring, metals monitoring,, and PM course.

CARBON MONOXIDE (CO)

Louisville Metro Air Pollution Control District: 2010 Carbon Monoxide Ambient Air Monitoring Network

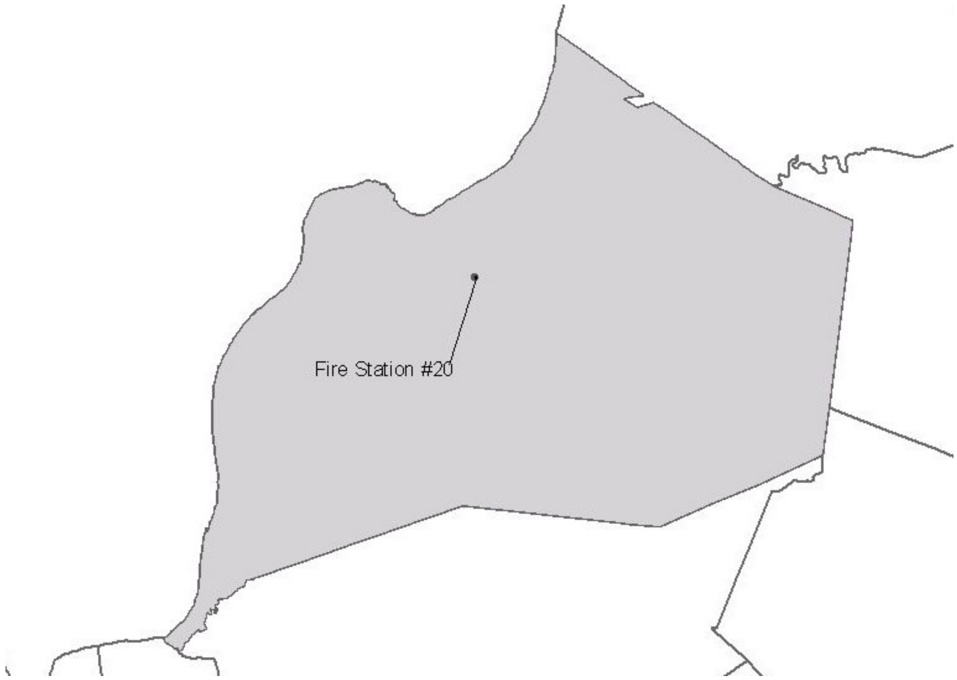


Figure 30: Carbon monoxide monitoring in Kentucky is currently conducted only in the Louisville Metro region due to statewide compliance. Jefferson County historically has had higher levels of CO than elsewhere in the state, perhaps due to the high levels of vehicle traffic in the area.

Carbon monoxide (CO) is an odorless, colorless, poisonous gas that is produced by the incomplete combustion of carbon containing fuels. The primary source of carbon monoxide is the exhaust from motor vehicles including highway and off-road vehicles, such as construction equipment. Other sources include industrial processes, and kerosene or wood burning stoves in homes.

Environmental Impacts

The main health effect of carbon monoxide is its tendency to reduce the oxygen carrying capacity of blood. Carbon monoxide enters the bloodstream in the lungs where it binds chemically with the hemoglobin in red blood cells. Hemoglobin normally carries oxygen to organs and tissues but because CO binds with the hemoglobin over 200 times more readily than oxygen, the amount of oxygen absorbed into the bloodstream is greatly reduced when CO is present.

Depending on the level of exposure, CO can cause fatigue and headaches and can impair vision and reflexes. Unconsciousness and even death may occur at high concentrations. The severity of the effects is related to the length of exposure and concentration level of CO.

How is CO Monitored?

Carbon monoxide is monitored continuously by analyzers that operate using the non-dispersive infrared photometry method. In this method, ambient air is drawn into a sample cell and a beam of infrared light is passed through the sample. Carbon monoxide absorbs infrared light and any decrease in the intensity of the beam is due to the presence of CO. The decrease is directly related to the concentration of CO in the ambient air. A detector measures the difference between the sample cell beam and a duplicate beam passing through a reference cell with no CO present.

The difference is translated into a measure of the CO present in the ambient air. Data from the analyzer is transmitted, by telemetry, for entry into an automated data storage system. In 2010, the Louisville Metro Air Pollution Control District operated one CO monitor in Jefferson County.

Results

There were no exceedances of the CO standards in 2010. The last exceedance of a standard occurred on January 7, 1998, in Ashland when an 8-hour average of 11.7 ppm was recorded. All Kentucky counties are currently in attainment of the standards for carbon monoxide.

Statewide and regional carbon monoxide levels have declined substantially since 1980, primarily due to improved emission controls on motor vehicles. Due to the substantial drop in monitored levels, carbon monoxide monitoring was discontinued statewide in 2003, except for Jefferson County. The 2003 statewide discontinuation of CO monitors accounts for the dramatic uptrend from 2003 to 2004, because since 2004 the annual average has been based on data only from Jefferson County. Jefferson County has historically had higher CO levels than the rest of the state.

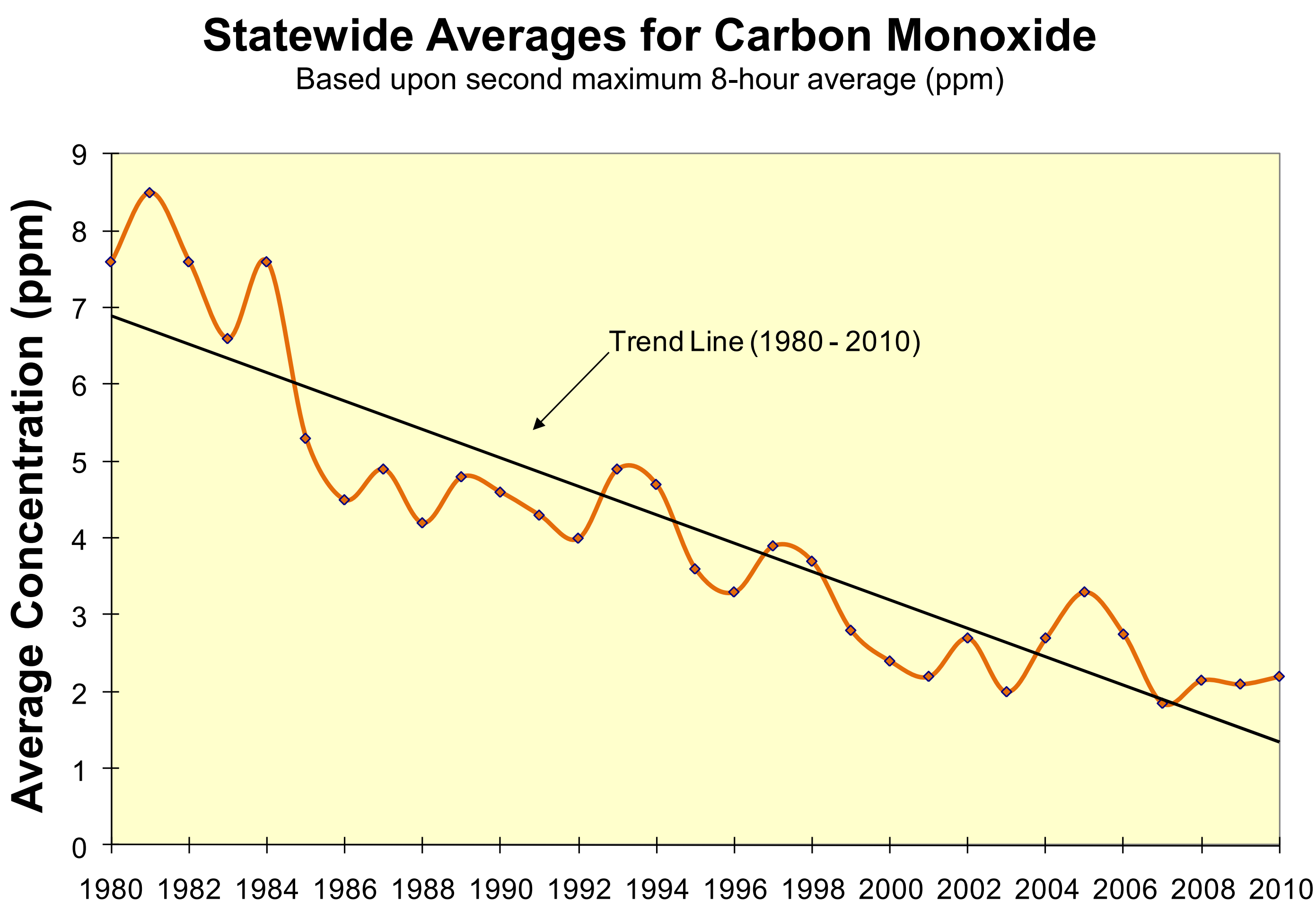


Figure 31: Statewide averages for CO monitoring indicate pollution reductions.

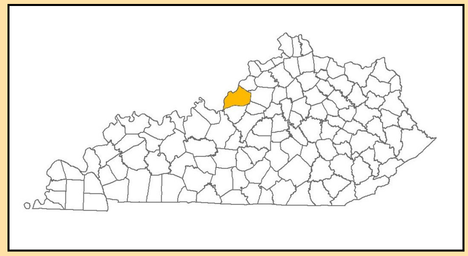
National Ambient Air Quality Standards for Carbon Monoxide

Primary NAAQS: **8-hour average not to exceed 9 ppm more than once per year**
1-hour average not to exceed 35 ppm more than once per year

Secondary NAAQS: **None**

Criteria Pollutant Summary Report – 2010

Pollutant: **Carbon Monoxide**
Method: Instrumental/Non-Dispersive Infrared Photometry
Data Interval: Hourly
Units: Parts-per-million (ppm)



County	Site Address	AQS-ID	# Obs	1-Hr Averages			8-Hr Averages		
				1st max	2nd max	Obs> 35.0	1st max	2nd max	Obs > 9.0
Jefferson	1735 Bardstown Road Louisville	21-111-1019	8566	3.3	2.9	0	2.3	2.2	0

Carbon monoxide monitors located in Jefferson County are operated by the Louisville Metro Air Pollution Control District.

2010 Lead Ambient Air Monitoring Network

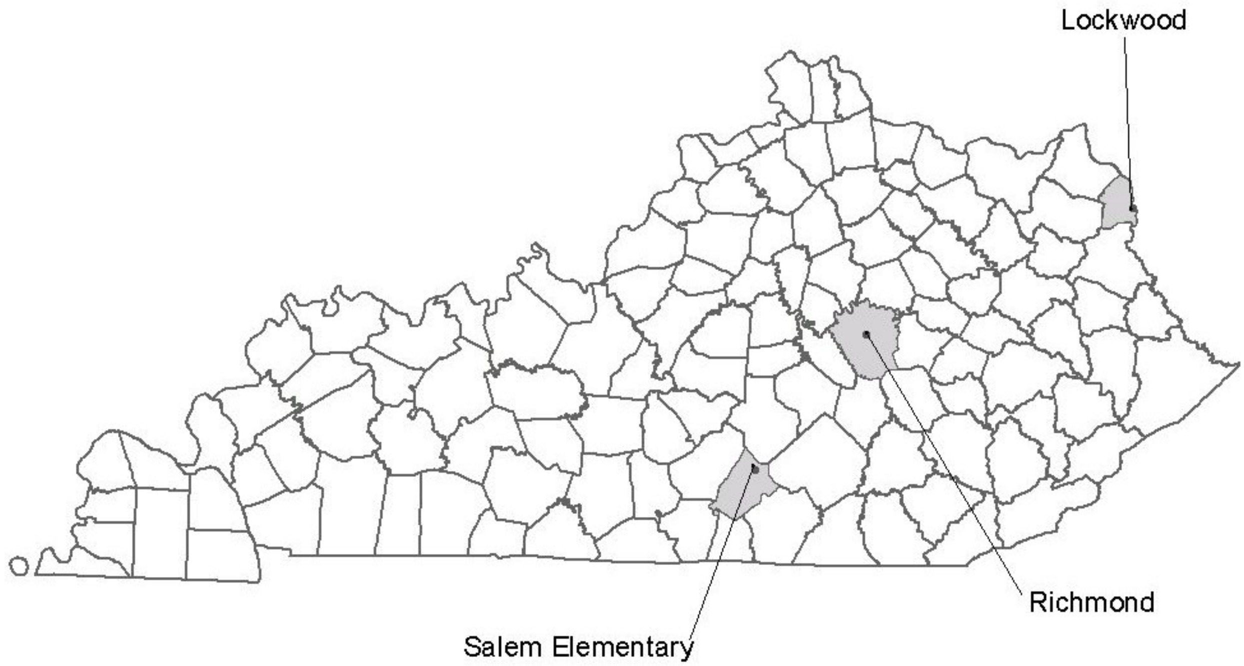


Figure 32: Lead monitoring locations in Kentucky.

Lead is a soft, blue-gray metal that occurs naturally. However, the historical use of lead in gasoline, paint, and plumbing, along with modern use in batteries, bridge paint, and plastic has caused lead to accumulate in the environment. The accumulation of lead in the environment is the reason lead can be found in everyone's body today.

On November 12, 2008, the NAAQS for lead was lowered from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$. The NAAQS required State, Tribal, and Local agencies to monitor near sources that emit more than one ton of lead per year . The division identified three sources that emitted over one ton of lead annually and began monitoring near the sources in 2010. In December 2010, the EPA released a new set of monitoring requirements. The new monitoring rule requires lead monitoring near sources that emit more than 0.5 tons per year. The new rule also requires lead monitoring at sites designated as NCore in core-based statistical areas with populations greater than 500,000. LMAPCD operates one such NCore site. New lead monitors are required to be established in 2011.

Environmental Impacts

Injestion of lead is the first major pathway of exposure. Inhalation is the second leading pathway of exposure for lead. Only 20 percent to 70 percent of injested lead is absorbed into the body whereas almost all of the lead inhaled is absorbed into the body. Children absorb lead into their system faster than an adult.

Lead can accumulate in soil, water, and sediments through deposition from air sources. The accumulation can damage ecosystems through the loss of biodiversity, changes in community composition, and decreased growth and reproductive rates in plants and animals.

Lead contamination can cause nervous system and kidney damage, learning disabilities, poor muscle coordination, decreased bone and muscle growth, and hearing damage in children. Lead can also effect adult nervous systems. However, most adults require a much larger exposure than a child to have a negative health impact.

How is lead monitored?

Lead concentrations are determined from the analysis of suspended particulates collected by high volume particulate samplers. These samplers use a brushless motor and a critical flow orifice in order to achieve a sampling flow rate between 1.10 and 1.70 cubic meters per minute (m3/min) over the course of 24 hours. Samples are collected on 8x10 glass fiber filters. Upon collection, the filters are sent to an EPA certified laboratory for analysis. The sample filters are cut into strips, acid digested according to 40 CFR Part 50, Appendix G, and analyzed by Inductively Coupled Plasma with Mass Spectroscopy Detection (ICP-MS).

Results

There were no exceedances of the three-month rolling average standard of 0.15 $\mu g/m^3$ in 2010.

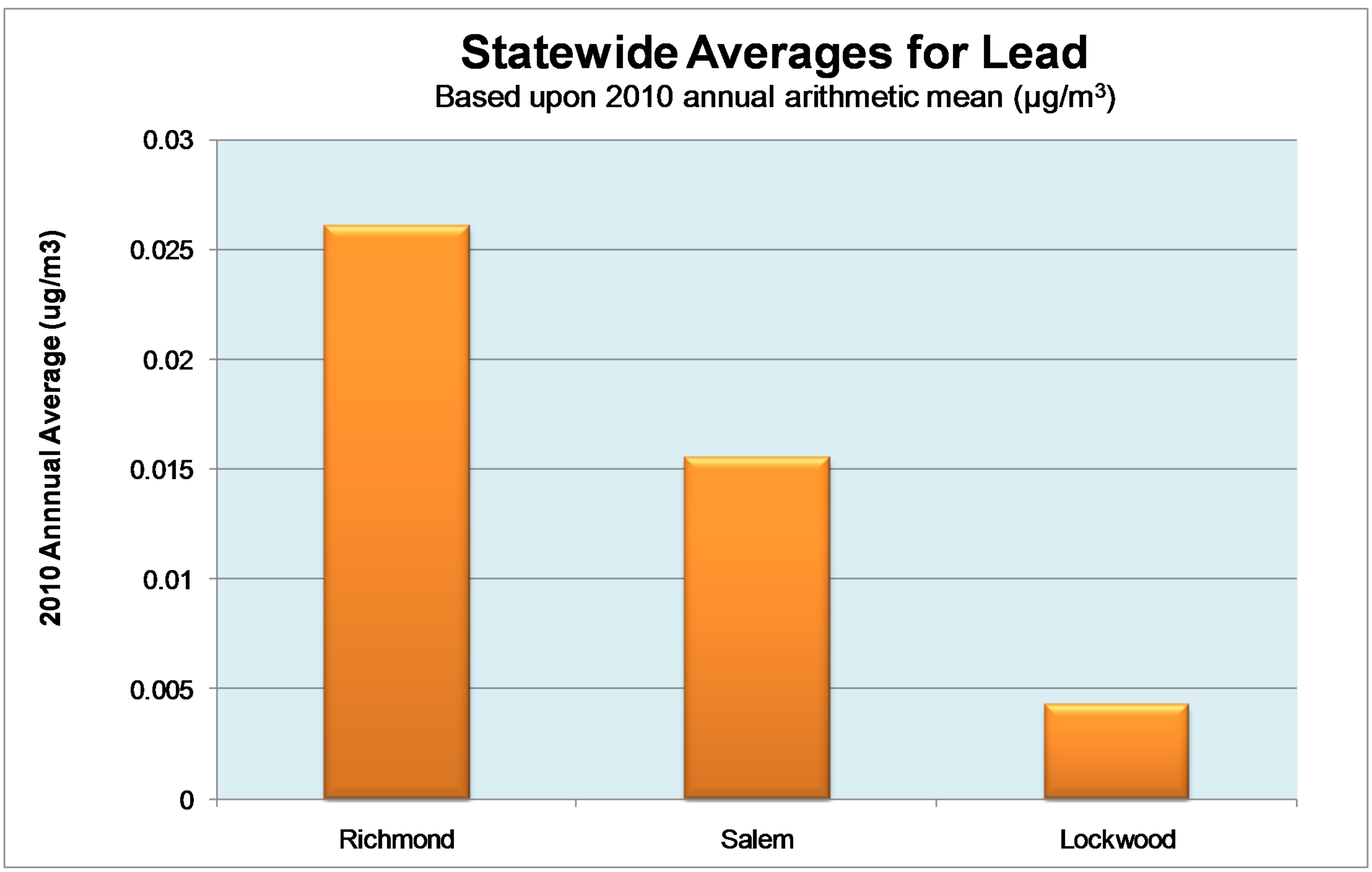


Figure 33: Statewide averages for lead based upon annual arithmetic mean per site. Trend analysis is not available, since monitoring data is only available for 2010.

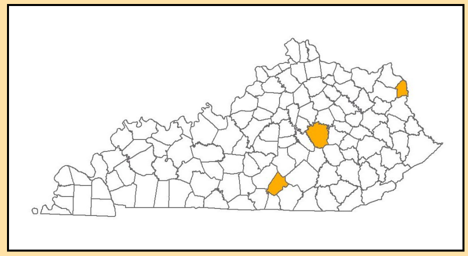
National Ambient Air Quality Standards for Lead

Primary NAAQS: **Rolling 3-month average not to exceed 0.15 µg/m³**

Secondary NAAQS: **Same as primary standard**

Criteria Pollutant Summary Report – 2010

Pollutant: **Lead**
Method: High volume sampler; Inductively Coupled Plasma-Mass Spectroscopy
Data Interval: 24-hour
Units: Micrograms per cubic meter (µg/m³)



County	Site Address	AQS-ID	# Obs	Rolling 3- Month Average				
				1st max	2nd max	3rd max	4th max	Obs > 0.15
Boyd	Lockwood Estates Catlettsburg	21-019-0016	40	.009	.008	.007	.004	0
Madison	300 Bond Street Richmond	21-151-0003	57	.049	.023	.023	.023	0
Russell	1409 S. Highway 76 Russell Springs	21-207-0001	24	.019	.016	.013	.012	0

2010 Nitrogen Dioxide Ambient Air Monitoring Network

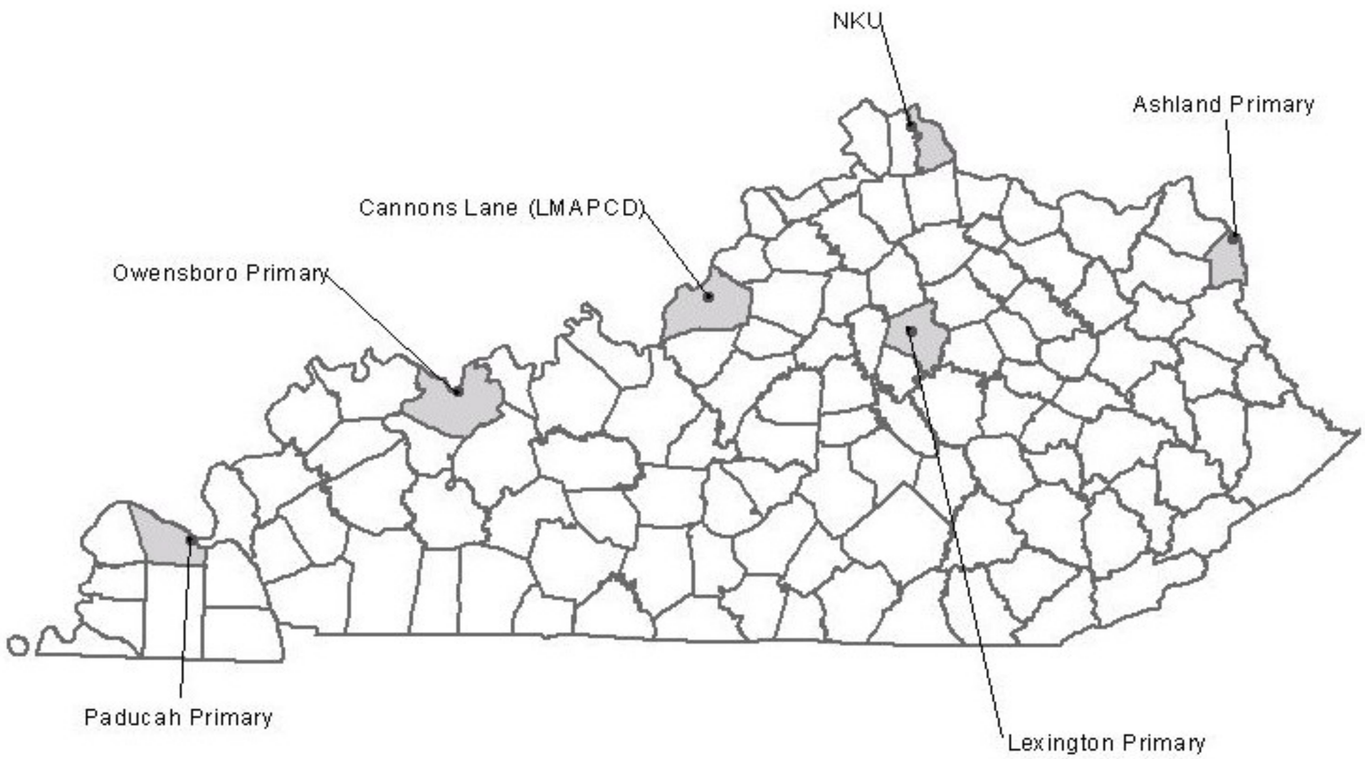


Figure 34: Nitrogen dioxide monitoring locations in Kentucky.

Nitrogen dioxide is a reddish brown gas that is produced during high temperature combustion. During combustion, nitrogen, and oxygen are combined, or oxidized, to form a family of highly reactive gases called nitrogen oxides (NO_x), which includes nitrogen dioxide (NO_2) and nitrogen oxide (NO). In addition to the NO_2 produced during combustion, the NO produced may, in the presence of sunlight, undergo a photochemical reaction that will also form NO_2. The rate of reaction is dependent upon the intensity of the sunlight. Major combustion or oxidation sources that produce NO_2 include motor vehicles, power plants, incinerators, boilers, and chemical processes.

Environmental Impacts

The primary health effect of NO_2 is as a lung irritant, which can cause an increase in respiratory rate, a decrease in lung function, and an increase the susceptibility of the respiratory system to infection. Nitrogen oxides are also considered detrimental to human health due to their association in the formation of ozone and the resulting health effects caused by that pollutant.

NO_2 is a contributor to the formation of acid precipitation, which can damage plant life, aquatic life, cause the deterioration of stone/masonry-type buildings, and deteriorate statues.

Nitrogen oxides also react with ammonia to form ammonium nitrate, a component of $PM_{2.5}$. Nitrates are also a key component in regional haze that has been attributed to poor visibility in the southeast region of the United States.

How is NO_2 monitored?

Nitrogen dioxide is monitored continuously by analyzers that utilize the principle of photometric detection of the chemiluminescence (light) resulting from the gas phase reaction of nitric oxide (NO) and ozone. When these two gases react, light at a specific wavelength is produced.

In operation, sample air is drawn into the analyzer and split into two streams. The first air stream reacts directly with ozone (which is produced by a generator in the analyzer) and the light energy produced is proportional to the NO in the sample. Since NO_2 does not react with ozone, the second stream of air passes through a catalytic converter that converts the NO_2 in the sample to NO. The second air stream then reacts with ozone, providing a total measurement of nitrogen oxides (NO_x) in the sample.

The assumption is that the majority of the NO_x value is not NO_2. By subtracting the second air stream NO concentration from the first stream NO_x concentration, a NO_2 value is obtained. Data from the analyzer is transmitted into an automated data storage system. In 2010, the DAQ and the LMAPCD operated six nitrogen dioxide monitors in Kentucky.

Results

On January 22, 2010, the EPA added an additional primary NO_2 standard. The new NAAQS was set to 100 ppb, measured as the three-year average of the 98^{th} percentile of the daily maximum one-hour averages. The EPA also maintained the annual NAAQS, which is set to 53 ppb. There were no exceedances of the NO_2 standard in 2010, and there have been no recorded exceedances of a NAAQS since the inception of sampling in 1970. Statewide nitrogen dioxide levels show a steady downward trend, primarily due to the use of pollution control devices on motor vehicles, power plants and industrial boilers.

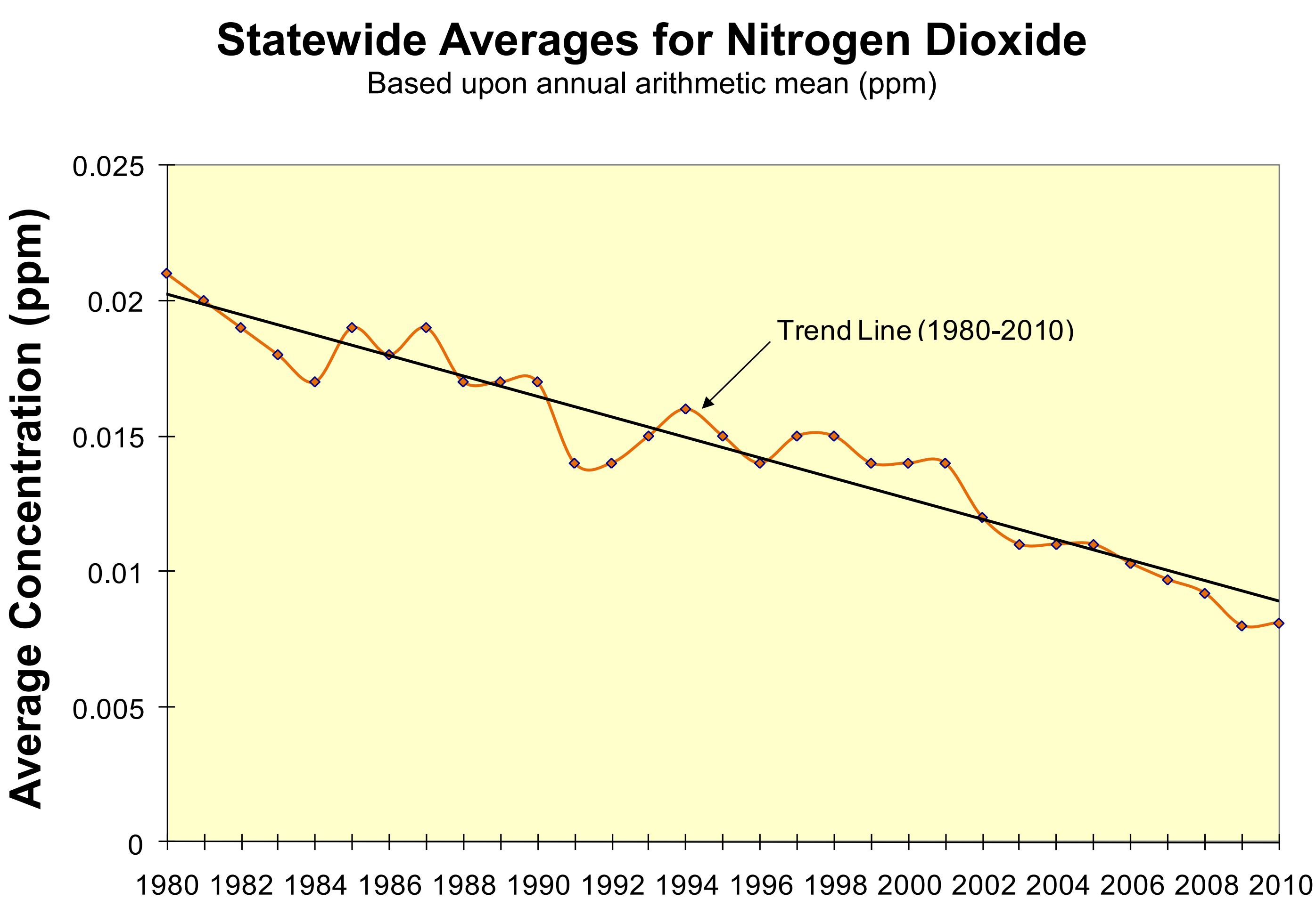


Figure 35: Statewide averages for nitrogen dioxide monitoring indicate pollution reductions.

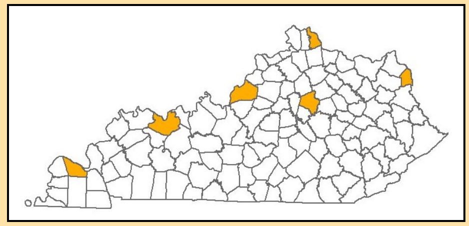
National Ambient Air Quality Standards for Nitrogen Dioxide

Primary NAAQS: **Annual arithmetic mean must not exceed 53 ppb**
3-year average of the 98th percentile of daily maximum one hour averages must not exceed 100 ppb

Secondary NAAQS: **Same as Primary Standard**

Criteria Pollutant Summary Report – 2010

Pollutant: **Nitrogen Dioxide**
Method: Instrumental/Gas-Phase Chemiluminescence
Data Interval: Hourly
Units: Parts-per-billion (ppb)



County	Site Address	AQS-ID	# Obs	Annual Arithmetic Mean	Obs > 53
Boyd	2924 Holt Street Ashland	21-019-0017	8259	8.46	0
Campbell	524A John Hill Road Highland Heights	21-037-3002	8258	4.52	0
Daviess	US 60 and Pleasant Valley Road Owensboro	21-059-0005	8233	7.06	0
Fayette	650 Newtown Pike Lexington	21-067-0012	8254	9.46	0
Jefferson[1]	2730 Cannons Lane Louisville	21-111-0067	7677	11.95	0
McCracken	2901 Powell Street Paducah	21-145-1024	8242	6.87	0

[1] Nitrogen dioxide monitors located in Jefferson County are operated by the Louisville Metro Air Pollution Control District.

NO_2 Criteria Pollutant Multi-Year Summary Report – 2010
98^{th} Percentile Daily 1-Hour Maximum, 3-Year Average

County	Site Address	AQS-ID	98^{th} Percentile Daily Maximum 1-Hr Averages				
			2008	2009	2010	3-Yr Avg	Obs > 100
Boyd	2924 Holt Street Ashland	21-019-0017	42.0	36.0	37.0	38.3	0
Campbell	524A John Hill Road Highland Heights	21-037-3002	37.0	31.0	39.0	35.7	0
Daviess	US 60 and Pleasant Valley Road Owensboro	21-059-0005	35.0	35.0	38.0	36.0	0
Fayette	650 Newtown Pike Lexington	21-067-0012	49.0	44.0	56.0	49.7	0
Jefferson[1]	2730 Cannons Lane Louisville	21-111-0067	n/a	n/a	58.0	58.0 *	0
McCracken	2901 Powell Street Paducah	21-145-1024	42.0	40.0	47.0	43.0	0

* Incomplete data set. The mean does not satisfy summary criteria.

[1] Nitrogen dioxide monitors located in Jefferson County are operated by the Louisville Metro Air Pollution Control District.

OZONE (O_3)

2010 Ozone Ambient Air Monitoring Network

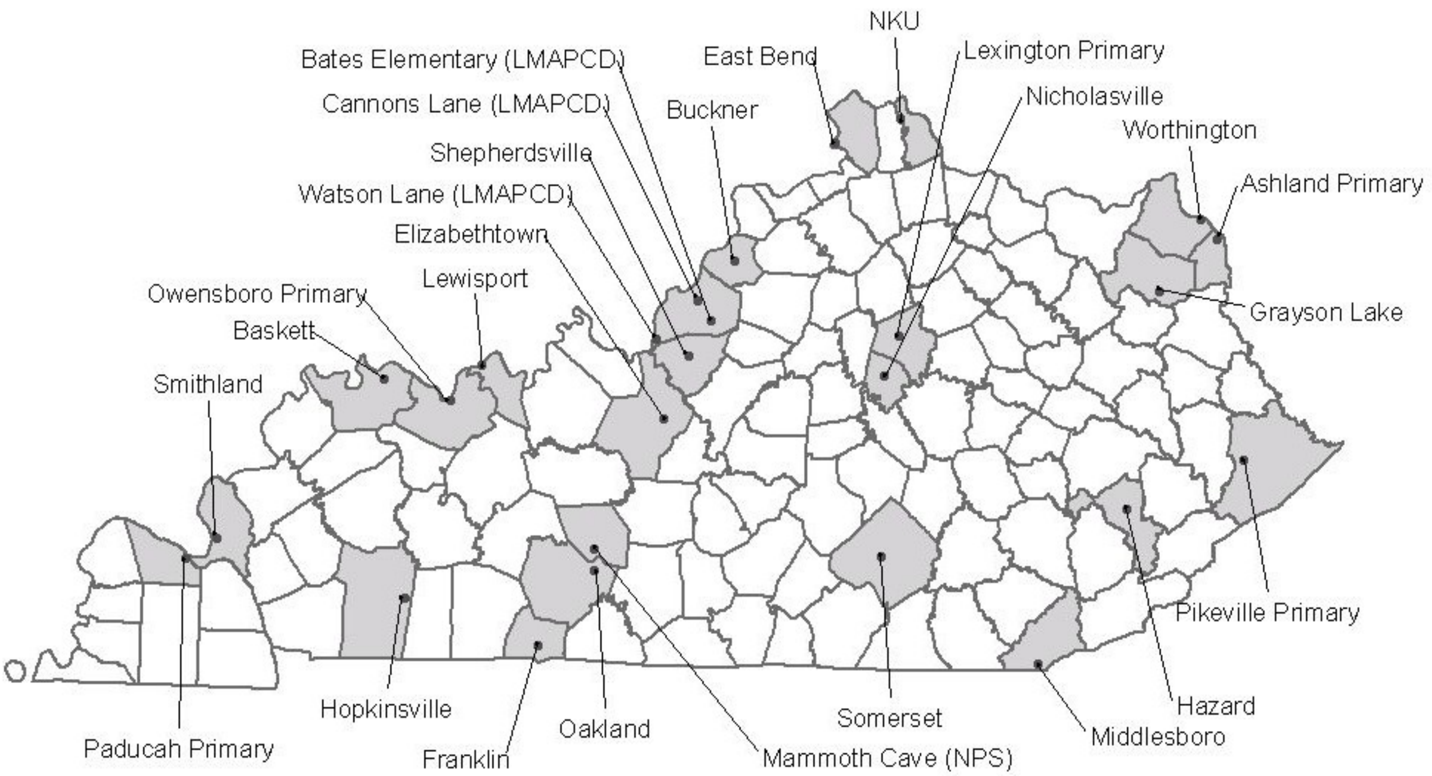


Figure 36: Ozone monitoring locations in Kentucky.

Ozone (O_2) is a colorless gas that is not emitted directly into the atmosphere from sources, but rather forms in the atmosphere from a photochemical reaction between volatile organic compounds (VOCs) and nitrogen oxides (NO_x) in the presence of sunlight. Sources of VOCs include motor vehicle exhaust, dry cleaning, paint solvents, and evaporation of gasoline from storage and fuel transfer facilities. Sources of NO_x include emissions from motor vehicles, boilers, and power plants.

Environmental Impacts

In the upper atmosphere, naturally occurring stratospheric ozone (commonly called the ozone layer) shields the earth's surface from the sun's harmful ultraviolet rays. However, tropospheric ozone, also known as ground-level ozone, can trigger health problems at low level exposure, cause permanent lung damage after long term exposure, and can damage ecosystems.

How is O_3 monitored?

Ozone is monitored from March 1st through October 31st each year, when meteorological conditions are most conducive to the formation of ozone. Analyzers, which operate continuously, monitor ozone by using the ultraviolet photometry method. In this method, ambient air is drawn into a sample cell and a beam of ultraviolet light is passed through the cell.

Ozone absorbs ultraviolet light and a decrease in the intensity of the light indicates the presence of ozone. The intensity of the light is first measured with no ozone present to determine a reference value. An ambient sample is then introduced and the intensity of the resultant light is measured by an ultraviolet detector. The amount of light absorbed by the sample indicates the level of ozone present. Data from the analyzers are transmitted into an automated data storage system. In 2010, DAQ, the National Park Service at Mammoth Cave, and the Louisville Metro Air Pollution Control District operated a total of 26 ozone monitors in Kentucky.

Results

In November 1997, the EPA adopted an eight-hour ozone standard based on scientific and medical research, which indicated that extended exposure to lower levels of ozone might be as harmful as short-term exposure to elevated levels. The eight-hour standard was set at 0.08 ppm. On May 27, 2008, the EPA adopted a new 8-hour standard set at 0.075 ppm. However, on September 16, 2009, EPA notified the Court of its decision to initiate a rulemaking to reconsider the 2008 ozone standard. On January 19, 2010, EPA's proposed rule was published in the Federal Register. At the time of publication of this report, a final rule was expected in August 2011. In the interim, the 1997 ozone standard of 0.08 has been in effect.

Since the 1997 standard is expressed to two significant figures, the standard is attained when the fourth highest daily maximum eight-hour average for each of the three most recent years are averaged and that average is 0.084 ppm or less. In 2010, there were six daily maximum eight-hour averages that were greater than .084 ppm. Only one site, in Louisville, had a fourth highest daily maximum in exceedance of the eight-hour standard.

Generally, there has been a decline in ozone levels over the past twenty-five years based on one-hour data. This downward trend is the result of emission controls on vehicles and a regional strategy controlling of NO_x emissions from large stationary internal combustion engines, large boilers and turbines used in power plants, and other industrial applications.

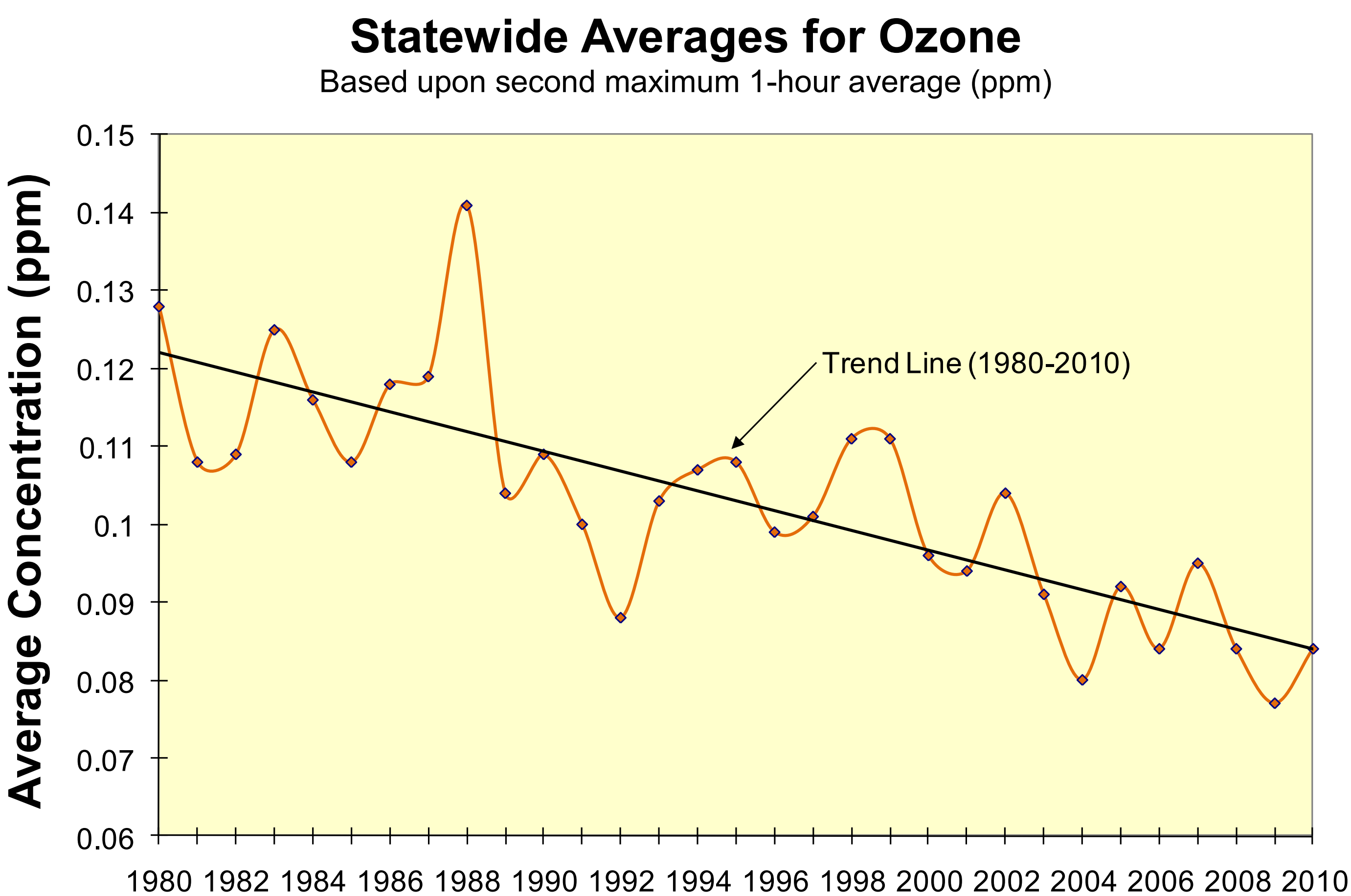


Figure 37: Statewide averages for ozone monitoring indicate pollution reductions.

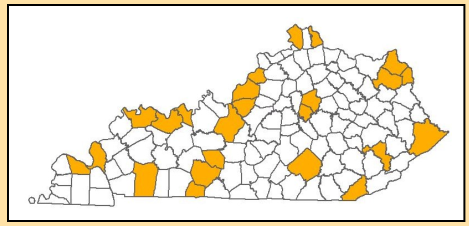
National Ambient Air Quality Standards for Ozone

Primary NAAQS: **3-year average of the 4^{th} highest daily maximum 8-hr concentration not to exceed 0.08 ppm (0.084 ppm with three significant digits).**

Secondary NAAQS: **Same as Primary Standard**

Criteria Pollutant Summary Report – 2010

Pollutant: **Ozone**
Method: Ultra-Violet Photometry
Data Interval: Hourly
Units: Parts-per-million (ppm)



County	Site Address	AQS-ID	Valid Days Meas.	Daily Maximum 8-Hr Average				
				Obs> 0.084	1^{st} max	2^{nd} max	3^{rd} max	4^{th} max
Bell	34^{th} & Dorchester Middlesboro	21-013-0002	242	0	.075	.071	.069	.068
Boone	KY 338 & Lower River East Bend	21-015-0003	245	0	.081	.072	.067	.067
Boyd	2924 Holt Street Ashland	21-019-0017	244	0	.076	.075	.073	.072
Bullitt	2^{nd} & Carpenter St Shepherdsville	21-029-0006	241	0	.076	.076	.075	.074
Campbell	524A John Hill Rd Highland Heights	21-037-3002	238	0	.080	.075	.075	.073
Carter	Camp Webb Grayson Lake	21-043-0500	244	0	.075	.072	.071	.071
Christian	10800 Pilot Rock Hopkinsville	21-047-0006	237	0	.077	.076	.074	.074
Daviess	US 60 and Pleasant Valley Owensboro	21-059-0005	241	0	.080	.075	.075	.072
Edmonson[1]	Alfred Cook Road Mammoth Cave	21-061-0501	239	0	.078	.077	.075	.075
Fayette	650 Newtown Pike Lexington	21-067-0012	243	0	.075	.073	.072	.071
Greenup	Scott & Center St Worthington	21-089-0007	243	0	.077	.074	.073	.071
Hancock	2^{nd} & Caroline Lewisport	21-091-0012	239	0	.077	.076	.074	.073
Hardin	801 North Miles St Elizabethtown	21-093-0006	240	0	.074	.072	.072	.071
Henderson	Baskett Fire Dept. Baskett	21-101-0014	237	0	.077	.076	.076	.074
Jefferson[2]	7601 Bardstown Rd Louisville	21-111-0027	245	0	.079	.079	.077	.075
Jefferson[2]	7201 Watson Lane Louisville	21-111-0051	245	1	.085	.082	.077	.074
Jefferson[2]	2730 Cannons Lane Louisville	21-111-0067	237	4	.096	.089	.088	.085

Ozone Criteria Pollutant Summary Report – 2010 Continued

County	Site Address	AQS-ID	Valid Days Meas.	Daily Maximum 8-Hr Average				
				Obs> 0.084	1st max	2nd max	3rd max	4th max
Jessamine	KYDOT, Etter Drive Nicholasville	21-113-0001	244	0	.073	.072	.071	.069
Kenton	1401 Dixie Highway Covington	21-117-0007	90 *	0	.075	.068	.066	.064
Livingston	KYDOT 811 US 60E Smithland	21-139-0003	244	0	.073	.068	.067	.067
McCracken	2901 Powell Street Paducah	21-145-1024	245	0	.077	.075	.074	.073
Oldham	DOT Garage, 3995 Morgan Buckner	21-185-0004	242	1	.090	.081	.080	.078
Perry	Perry Co Horse Park Hazard	21-193-0003	245	0	.075	.073	.071	.071
Pike	101 North Mayo Trail Pikeville	21-195-0002	235	0	.072	.071	.070	.070
Pulaski	Clifty Street Somerset	21-199-0003	245	0	.070	.070	.068	.066
Simpson	KYDOT, HWY 1008 Franklin	21-213-0004	243	0	.074	.074	.073	.073
Warren	Oakland Elementary School Oakland	21-227-0008	222	0	.072	.072	.068	.068

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set.
Values in red are a visual representation of an exceedance of the NAAQS.

Ozone Criteria Pollutant Multi-Year Summary Report – 2010
8-hour 4th Maximum, 3-year Average

County	Site Address	AQS-ID	4th Maximum 8-hr Average			
			2008	2009	2010	3-Yr Avg
Bell	34th & Dorchester Middlesboro	21-013-0002	.070	.060	.068	.066
Boone	KY 338 & Lower River Road East Bend	21-015-0003	.064	.064	.067	.065
Boyd	2924 Holt Street Ashland	21-019-0017	.073	.066	.072	.070
Bullitt	2nd & Carpenter Streets Shepherdsville	21-029-0006	.069	.064	.074	.069
Campbell	524A John Hill Highland Heights	21-037-3002	.075	.068	.073	.072
Carter	Camp Webb Grayson Lake	21-043-0500	.072	.063	.071	.068
Christian	10800 Pilot Rock Road Hopkinsville	21-047-0006	.069	.066	.074	.069
Daviess	US 60 & Pleasant Valley Rd Owensboro	21-059-0005	.072	.067	.072	.070
Edmonson[1]	Alfred Cook Road Mammoth Cave	21-061-0501	.070	.065	.075	.070
Fayette	650 Newtown Pike Lexington	21-067-0012	.070	.063	.071	.068
Greenup	Scott & Center Streets Worthington	21-089-0007	.074	.063	.071	.069
Hancock	2nd & Caroline Streets Lewisport	21-091-0012	.072	.069	.073	.071
Hardin	801 North Miles Street Elizabethtown	21-093-0006	.074	.066	.071	.070
Henderson	Baskett Fire Dept Baskett	21-101-0014	.074	.071	.074	.073
Jefferson[2]	7601 Bardstown Road Louisville	21-111-0027	.072	.068	.075	.071
Jefferson[2]	7201 Watson Lane Louisville	21-111-0051	.075	.078	.074	.075
Jefferson[2]	2730 Cannons Lane Louisville	21-111-1021	n/a	n/a	.085	.085 *
Jessamine	KYDOT, Etter Drive Nicholasville	21-113-0001	.069	.065	.069	.067
Kenton	1401 Dixie Highway Covington	21-117-0007	.073	.074	.064 *	.070 *
Livingston	KYDOT, 811 US 60 East Smithland	21-139-0003	.065	.066	.067	.066
McCracken	2901 Powell Street Paducah	21-145-1024	.071	.066	.073	.070
Oldham	DOT Garage, 3995 Morgan Rd Buckner	21-185-0004	.077	.068	.078	.074
Perry	Perry County Horse Park Hazard	21-193-0003	.073	.062	.071	.068
Pike	101 North Mayo Trail Pikeville	21-195-0002	.071	.062	.070	.067
Pulaski	Clifty Street Somerset	21-199-0003	.066	.061	.066	.064
Simpson	KYDOT, Hwy 1008 Franklin	21-213-0004	.071	.066	.073	.070
Warren	Oakland Elementary School Oakland	21-227-0008	.068	.058	.068	.064

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
Values in red are a visual representation of an exceedance of the NAAQS.

2010 Particulate Matter ($PM_{2.5}$) Ambient Air Monitoring Network

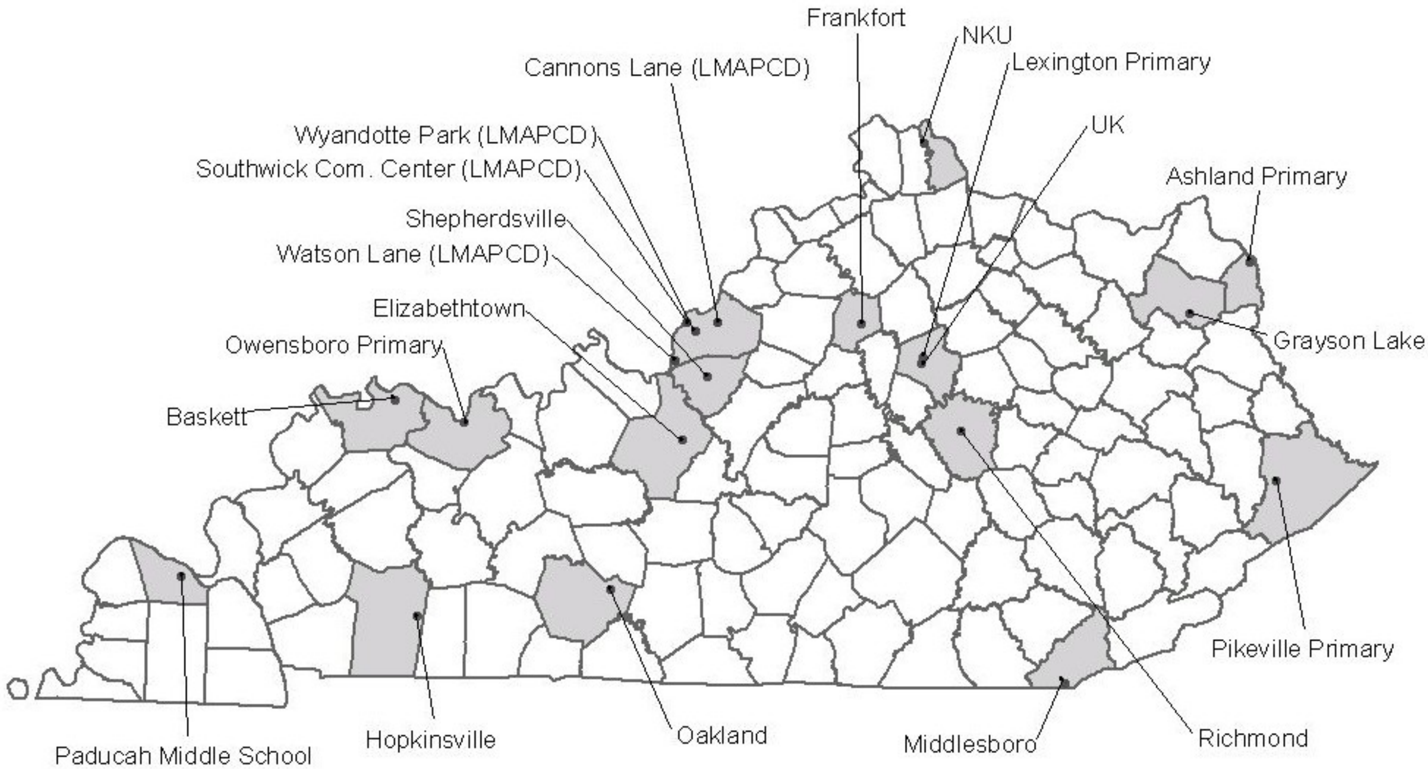


Figure 38: $PM_{2.5}$ monitoring locations in Kentucky.

Particulate Matter ($PM_{2.5}$) is a mixture of solid particles and liquid droplets that are 2.5 microns or smaller in size. Sources of $PM_{2.5}$ include power plants, wood burning, industrial processes, and fuel combustion. Fine particulates are also formed in the atmosphere when gases are transformed through chemical reactions. Sulfur dioxide, nitrogen oxides, and VOCs are all examples of gases that can transform by chemical reactions.

Environmental Impacts

Particulate matter of 2.5 microns or less has the ability to penetrate into the deepest parts of the lungs, causing chronic respiratory symptoms in sensitive populations and premature deaths in the elderly. $PM_{2.5}$ also affects the environment by reducing visibility (up to 70% in some areas of the U.S.) and contributing to acid rain.

How is $PM_{2.5}$ monitored?

The division currently operates continuous Tapered Element Oscillating Microbalance (TEOM) monitors, continuous FEM Beta Attenuation Monitors (BAM) monitors, and manual intermittent FRM and FEM samplers. However, only the FRM and FEM manual intermittent samplers are used for comparisons to the NAAQS. The BAM and TEOM monitors continuously report $PM_{2.5}$ Air Quality Index (AQI) results. The FRM and FEM manual samplers are used for calculation of the AQI for historic data.

The manual intermittent-type monitors collect a sample over a 24-hour run cycle. While most samplers operate every third day, some samplers operate every sixth day and others operate every day. These samplers operate by drawing a measured volume of air through a pre-weighed filter. Before reaching the filter, the air passes through an impaction chamber where larger particles fall out of the air stream while particles smaller than 2.5 microns pass on to the sample filter where they are collected.

After completion of the sample run, the filter is removed from the sampler and weighed to determine the mass of the particulates collected. In 2010, DAQ, the NPS at Mammoth Cave, and the LMAPCD operated a network of 40 continuous and intermittent samplers.

Results

There were ten exceedances of the 24-hour $PM_{2.5}$ standard and zero exceedances of the annual standard in 2010.

Additionally, no sampler exceeded either the three-year 24-hour (2008-2010) standard or the three-year (2008-2010) annual standard. This is a significant accomplishment.

Generally, statewide $PM_{2.5}$ levels have declined from 2000-2010 time period with a slight increase in 2005 and 2007.

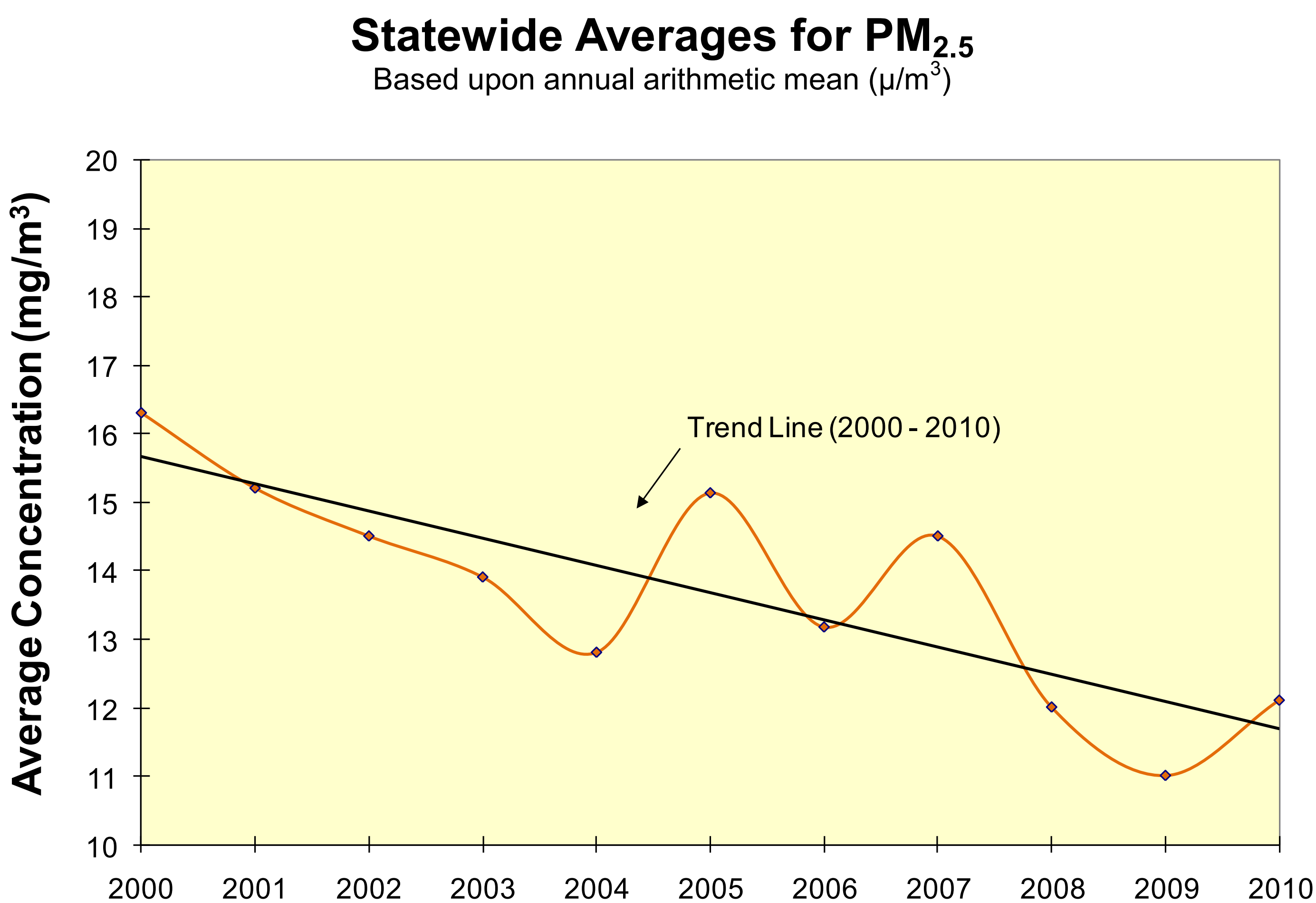


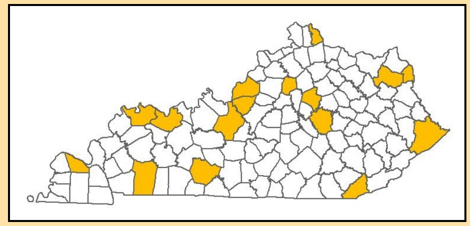
Figure 39: Statewide averages for $PM_{2.5}$ monitoring indicate pollution reductions.

National Ambient Air Quality Standards for Particulate Matter $PM_{2.5}$

Primary NAAQS: **3-year average of the weighted annual mean not to exceed 15.0 µg/m^3**
3-year average of the 98th percentiles of 24-hour concentrations not to exceed 35 µg/m^3

Secondary NAAQS: **Same as Primary Standard**

Criteria Pollutant Summary Report – 2010



Pollutant: **Particulate Matter $PM_{2.5}$**
Method: Gravimetric
Data Interval: 24-hour
Units: Micrograms per cubic meter (µg/m^3)

County	Site	AQS-ID	# Obs	Mean	24-Hour Average				
					Obs >35	1st max	2nd max	3rd max	4th max
Bell	34th & Dorchester Middlesboro	21-013-0002	60	12.87	1	37.0	28.3	23.2	23.0
Boyd	2924 Holt Street Ashland	21-019-0017	119	11.23	0	32.9	26.4	26.2	22.2
Bullitt	2nd & Carpenter Street Shepherdsville	21-029-0006	121	13.43	1	36.7	32.7	24.0	24.0
Campbell	524A John Hill Rd Highland Heights	21-037-3002	120	11.77	0	28.0	26.1	25.6	24.2
Carter	Camp Webb Grayson Lake	21-043-0500	120	9.87	0	33.7	23.2	20.2	20.2
Christian	10800 Pilot Rock Hopkinsville	21-047-0006	117	11.15	0	25.1	23.5	21.8	18.9
Daviess	US 60 and Pleasant Val-ley Rd Owensboro	21-059-0014	120	12.88	0	32.7	28.7	28.1	26.3
Fayette	650 Newtown Pike Lexington	21-067-0012	118	12.17	1	40.7	24.1	22.8	22.3
Fayette	533 South Limestone Lexington	21-067-0014	112	12.01	0	24.0	23.8	22.0	21.7
Franklin	803 Schenkel Lane Frankfort	21-073-0006	122	11.38	0	26.1	24.8	22.9	22.7
Hardin	801 North Miles Street Elizabethtown	21-093-0006	119	11.90	0	26.3	21.9	21.1	21.1

$PM_{2.5}$ Criteria Pollutant Summary Report – 2010 Continued

County	Site	AQS-ID	# Obs	Mean	24-Hour Average				
					Obs >35	1st max	2nd max	3rd max	4th max
Henderson	Basket Fire Dept Baskett	21-101-0014	120	12.45	0	26.7	26.0	24.4	23.5
Jefferson[1]	37th & Southern Avenue Louisville	21-111-0043	351	13.47	2	60.9	44.3	33.1	31.6
Jefferson[1]	1032 Beecher Avenue Louisville	21-111-0044	348	13.74	3	47.7	39.7	35.2	34.0
Jefferson[1]	7201 Watson Lane Louisville	21-111-0051	61	14.83	1	111.2	26.1	23.1	22.1
Jefferson[1]	2730 Cannons Lane Louisville	21-111-0067	119	13.27	1	36.3	26.1	25.8	25.2
Kenton	1401 Dixie Highway Covington	21-117-0007	51	12.13 *	0	27.9	22.0	21.0	20.7
McCracken	342 Lone Oak Road Paducah	21-145-1004	113	11.44	0	28.1	26.0	25.0	22.5
Madison	Mayfield School Richmond	21-151-0003	115	10.71	0	27.2	21.1	20.8	19.2
Ohio	Keytown Road Echols	21-183-0032	22	12.63 *	0	24.6	21.7	18.5	17.3
Pike	101 North Mayo Trail Pikeville	21-195-0002	119	10.42	0	30.4	29.1	23.6	23.5
Warren	Oakland Elementary Oakland	21-227-0008	117	11.50	0	23.7	20.7	20.5	20.2

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
Values in red are a visual representation of an exceedance of the NAAQS.

$PM_{2.5}$ Criteria Pollutant Multi-Year Summary Report – 2010
24-Hour 98th Percentile, 3-Year Average

County	Site	AQS-ID	24-Hour, 98th Percentile			
			2008	2009	2010	3-Yr Avg
Bell	34th & Dorchester Middlesboro	21-013-0002	24.4	23.1	28.3	25
Boyd	2924 Holt Street Ashland	21-019-0017	24.3	23.5	26.2	25
Bullitt	2nd & Carpenter Streets Shepherdsville	21-029-0006	25.4	23.1	24.0	24
Campbell	524A John Hill Highland Heights	21-037-3002	26.1	22.5	25.6	25
Carter	Camp Webb Grayson Lake	21-043-0500	22.6	16.9	20.2	20
Christian	10800 Pilot Rock Road Hopkinsville	21-047-0006	27.2	24.0 *	21.8	24 *
Daviess	US 60 and Pleasant Valley Rd Owensboro	21-059-0005	24.4	25.4	28.1	26
Fayette	650 Newtown Pike Lexington	21-067-0012	23.5	21.4	22.8	23
Fayette	533 South Limestone Lexington	21-067-0014	22.7	20.0	22.0	22
Franklin	803 Schenkel Lane Frankfort	21-073-0006	23.2	19.6	22.9	22
Hardin	801 North Miles Street Elizabethtown	21-093-0006	25.2	22.3	21.1	23
Henderson	Baskett Fire Dept Baskett	21-101-0014	24.3	26.2	24.4	25
Jefferson[1]	37th & Southern Avenue Louisville	21-111-0043	28.7	24.3	27.5	27
Jefferson[1]	1032 Beecher Avenue Louisville	21-111-0044	29.5	25.7	28.8	28
Jefferson[1]	7201 Watson Lane Louisville	21-111-0051	28.6	24.7	26.1	26
Jefferson[1]	2730 Cannons Lane Louisville	21-111-0048	n/a	24.1	25.8	25 *
Kenton	1401 Dixie Highway Covington	21-117-0007	25.2	23.1	22.0 *	23 *
McCracken	342 Lone Oak Road Paducah	21-145-1004	25.3	25.1	25.0	25
Madison	Mayfield School Richmond	21-151-0003	23.5	18.5	20.8	21
Ohio	Keytown Rd. Echols	21-183-0032	25.4	25.6	24.6 *	25 *
Pike	101 North Mayo Trail Pikeville	21-195-0002	21.2	23.5	23.6	23
Warren	Oakland Elementary Oakland	21-227-0008	28.6	21.0	20.7	23

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.

$PM_{2.5}$ Criteria Pollutant Multi-Year Summary Report – 2010
Annual Weighted Mean, 3-Year Average

County	Site	AQS-ID	Annual Weighted Mean			
			2008	2009	2010	3-Yr Avg
Bell	34th & Dorchester Middlesboro	21-013-0002	12.5	10.4	12.9	11.9
Boyd	2924 Holt Street Ashland	21-019-0017	12.1	10.9	11.2	11.4
Bullitt	2nd & Carpenter Streets Shepherdsville	21-029-0006	12.8	11.8	13.4	12.7
Campbell	524A John Hill Highland Heights	21-037-3002	11.8	11.3	11.8	11.6
Carter	Camp Webb Grayson Lake	21-043-0500	10.3	8.8	9.9	9.6
Christian	10800 Pilot Rock Road Hopkinsville	21-047-0006	11.9	10.7 *	11.2	11.3 *
Daviess	US 60 and Pleasant Valley Rd Owensboro	21-059-0005	12.0	11.9	12.9	12.2
Fayette	650 Newtown Pike Lexington	21-067-0012	12.1	11.1	12.2	11.8
Fayette	533 South Limestone Lexington	21-067-0014	12.1	11.0	12.0	11.7
Franklin	803 Schenkel Lane Frankfort	21-073-0006	11.5	10.4	11.4	11.1
Hardin	801 North Miles Street Elizabethtown	21-093-0006	12.2	10.9	11.8	11.6
Henderson	Baskett Fire Dept Baskett	21-101-0014	12.0	11.6	12.5	12.0
Jefferson[1]	37th & Southern Avenue Louisville	21-111-0043	13.2	12.2	13.5	13.0
Jefferson[1]	1032 Beecher Avenue Louisville	21-111-0044	13.4	12.5	13.7	13.2
Jefferson[1]	7201 Watson Lane Louisville	21-111-0051	12.8	11.6	14.8	13.1
Jefferson[1]	2730 Cannons Lane Louisville	21-111-0067	n/a	11.7	13.3	12.5 *
Kenton	1401 Dixie Highway Covington	21-117-0007	12.0	11.0	12.1 *	11.7 *
McCracken	342 Lone Oak Road Paducah	21-145-1004	11.8	11.5	11.4	11.6
Madison	Mayfield School Richmond	21-151-0003	10.4	9.7	10.7	10.3
Ohio	Keytown Rd. Echols	21-183-0032	12.1	11.1	12.6 *	11.9 *
Pike	101 North Mayo Trail Pikeville	21-195-0002	10.5	9.3	10.4	10.1
Warren	Oakland Elementary Oakland	21-227-0008	12.1	10.7	11.6	11.5

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.

2010 Particulate Matter ($PM_{2.5}$) Speciation Ambient Air Monitoring Network

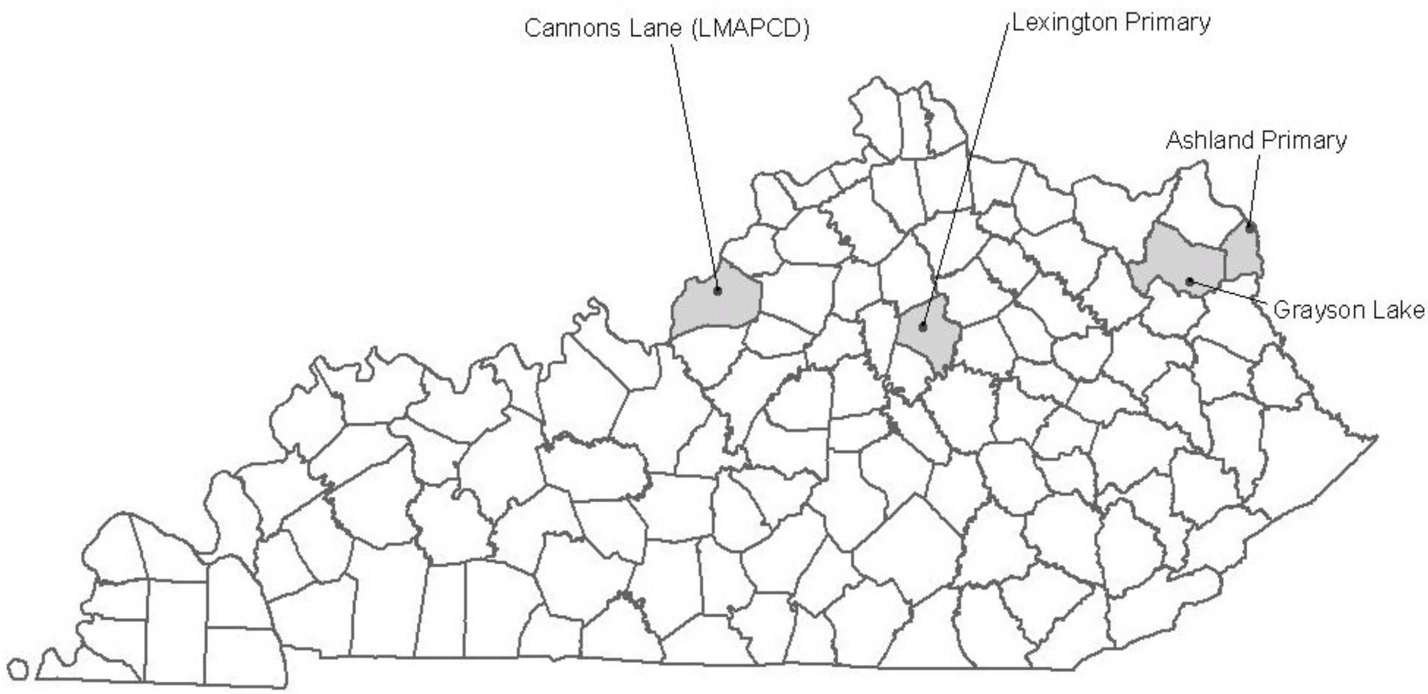


Figure 40: $PM_{2.5}$ speciation monitoring locations in Kentucky.

The promulgation of the new $PM_{2.5}$ standards may require all future areas not meeting the standards to reduce emissions of fine particulates and their precursors. Efficient air quality management requires knowing which sources contribute to the problem and estimating how much. However, determining $PM_{2.5}$ source contributions is complicated due to the fact that often half or more of the $PM_{2.5}$ mass is comprised of secondarily formed species, therefore hiding their point of origin. In addition, $PM_{2.5}$ may remain in the atmosphere for several days enabling sources several hundred miles away to affect an area. Realizing this, the EPA established the Speciation Trends Network designed to assist in identifying the compounds associated with fine particulates. The network is used to provide data on a target group of chemical species known to be significant contributors to $PM_{2.5}$ mass. The data provided by the network can be used to support several areas that include:

- Assisting the implementation of the $PM_{2.5}$ standard by using speciated data as input to air quality modeling analyses and as indicators to track progress of controls.
- Aiding the interpretation of health studies by linking effect to $PM_{2.5}$ constituents.
- Understanding the effect of atmospheric constituents on visibility impairment.
- Using the speciated particulate data to aid in monitoring network design and siting adjustment.

How is $PM_{2.5}$ speciation monitored?

The approach to be used for chemical speciation involves both sampling and analysis components. The target groups of chemical species include a list of analytes that consist of an array of cations, anions, carbon species, and trace elements. Because no one sample media is capable of providing the appropriate sample collection for all of the target analytes, each series of analytes requires sample collection on the appropriate media and utilization of the appropriate analytical techniques. One instrument collects $PM_{2.5}$ speciation samples. Samples are collected on a set of two filters, one comprised of Teflon and one comprised of nylon, over a 24-hour sampling period. A second instrument collects a sample on a quartz filter over a 24-hour sampling period. The quartz filter is used to collect a speciated carbon sample.

$PM_{2.5}$ speciation samples are sent to an EPA contract laboratory for analysis. Listed below are the target analytes and the analytical techniques used:

- Trace Elements: X-ray fluorescence and particle induced X-ray emission
- Anion and Cations: Ion chromatography
- Carbon: Controlled-combustion/thermal optical

Once analysis is complete, the analytes are grouped into the target chemical species listed below. These species in turn can be linked to source categories that ultimately can be used to assist in understanding $PM_{2.5}$ and developing control strategies needed to reduce ambient levels.

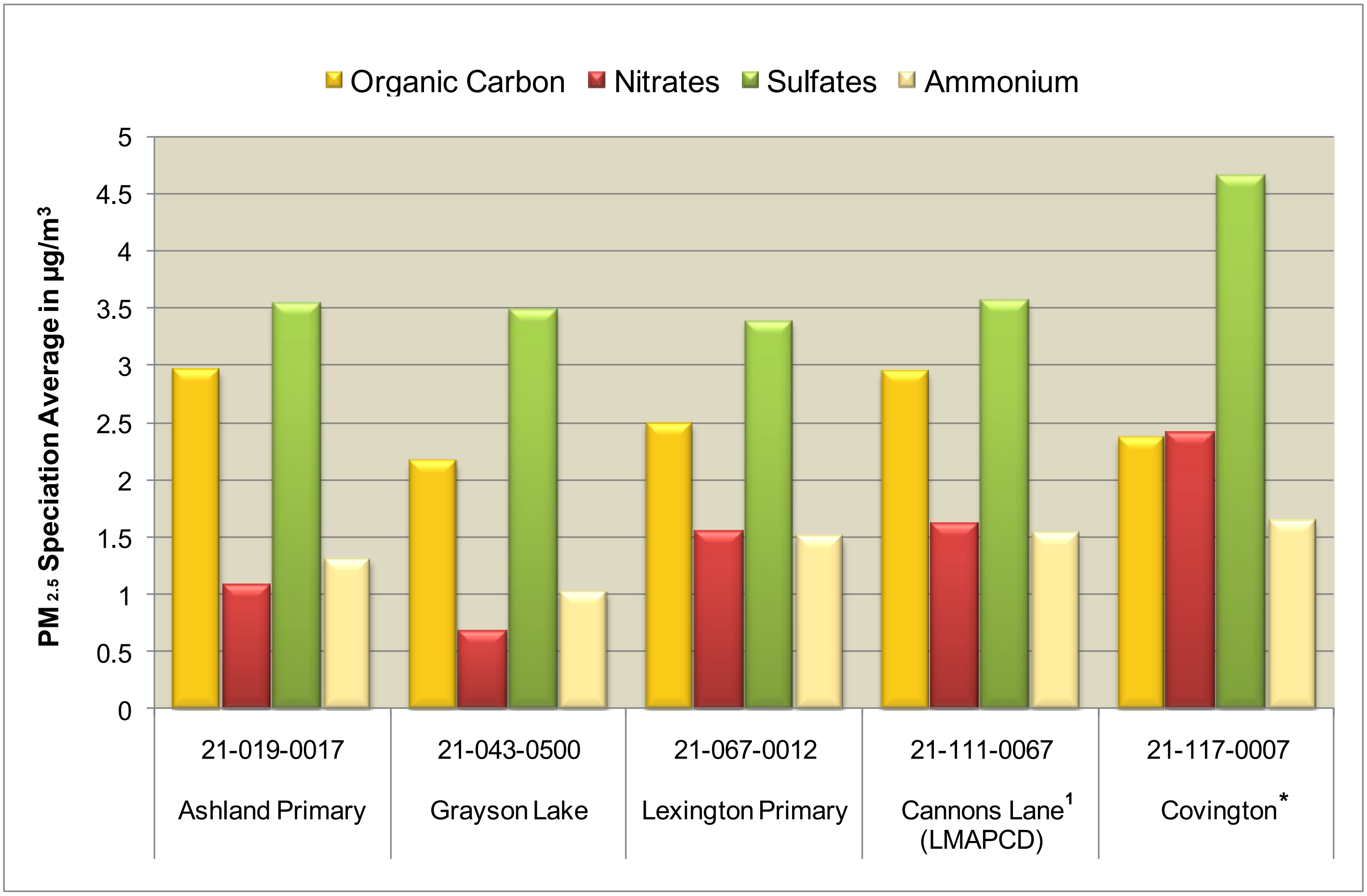
- Nitrate (total)
- Sulfate
- Ammonium
- Organic Carbon
- Elemental Carbon
- Crustal Component (trace elements, fine soil)
- Other ($PM_{2.5}$ mass unaccounted for by analytical methods)

Results

In 2010, the Kentucky Division for Air Quality operated a network of three Speciation Trends Network monitors and the Louisville Metro Air Pollution Control District operated one monitor. The sites are strategically located to address different types of land-use ranging from heavy industrial, urban, and rural. The chart on the following page provide a visual representation of the major components of speciation data collected at each site during 2010. The data suggests that sulfate and organic carbon are the primary contributors to $PM_{2.5}$ in Kentucky. Sulfates are formed from sulfur dioxide emissions with the major sources of those emissions being coal-fired power plants. Organic carbon comes from a combination of mobile and stationary combustion sources.

Statewide Averages for $PM_{2.5}$ Speciation

Based upon 2010 annual arithmetic mean ($\mu g/m^3$)



[1] Monitors operated by the Louisville Metro Air Pollution Control District.
*** Incomplete data set.**

Figure 41: $PM_{2.5}$ speciation data suggests that sulfate and organic carbon are the primary contributors to $PM_{2.5}$ in Kentucky.

2010 Particulate Matter (PM_{10}) Ambient Air Monitoring Network

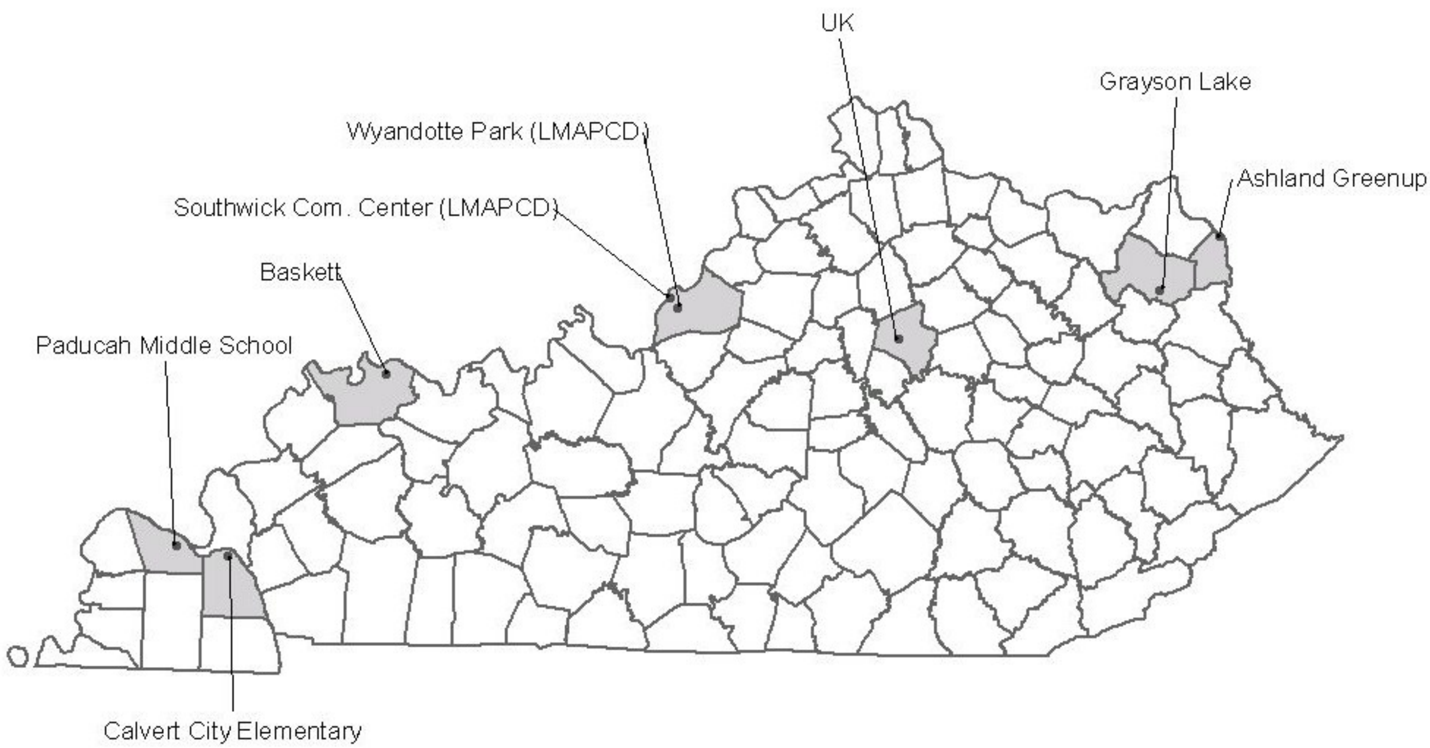


Figure 42: PM_{10} monitoring locations in Kentucky.

Particulate Matter of 10 microns or less in diameter (PM_{10}) is a mixture of solid particles and liquid droplets. Some common sources of PM_{10} are prescribed fires, construction activities, agricultural practices, and smokestacks.

Environmental Impacts

The primary health effects of particulates are that they aggravate respiratory and cardiovascular disease, and large amounts can increase the death rates of sufferers. The elderly, children, and people with chronic lung disease are especially sensitive to particulate matter.

Particulate matter can soil and damage a wide range of man-made items such as building surfaces. PM_{10} damages vegetation by interfering with plant photosynthesis due to the formation of a film on leaves that reduces exposure to sunlight.

Particulate pollution can also produce haze, which diminishes visibility and the amount of sunlight reaching the earth.

How is PM_{10} monitored?

For PM_{10} NAAQS comparisons, both intermittent and continuous monitor types may be used because they are both FRM or FEM equivalents. Most PM_{10} samplers are the intermittent type that operates for 24 hours, every sixth day. These samplers operate by drawing a measured volume of air through a pre-weighed filter over a 24-hour period. Before reaching the filter, the air passes through an impaction chamber where larger particles fall out of the air stream while particles smaller than ten microns pass on to the sample filter where they are collected.

After completion of the sample run, the filter is removed from the sampler and reweighed to determine the mass of the particulates collected. Sample results are entered manually into a data storage system. The network also includes continuously operating PM_{10} samplers that provide results daily. These samplers determine sample weights electronically and transmit results by telemetry into an automated data storage system. In 2010, the DAQ and the LMAPCD operated a combined network of 8 PM_{10} intermittent and continuous samplers in Kentucky.

Results

There were no exceedances of the annual PM_{10} standard in 2010. The last PM_{10} exceedance occurred on January 7, 2000, at a Louisville site (21-111-0043) where a 24-hour sample measured 152 μg/m^3. The only other exceedance of a PM_{10} standard occurred on August 27, 1990, in Ashland, where a 24-hour value measured 182 μg/m^3.

All Kentucky counties are currently in attainment with the PM_{10} standard. Statewide and regional PM_{10} levels have shown declining trends. This downward trend is the result of controls on industrial sources for particulate matter.

Statewide Averages for PM_{10}

Based upon annual arithmetic mean (μg/m^3)

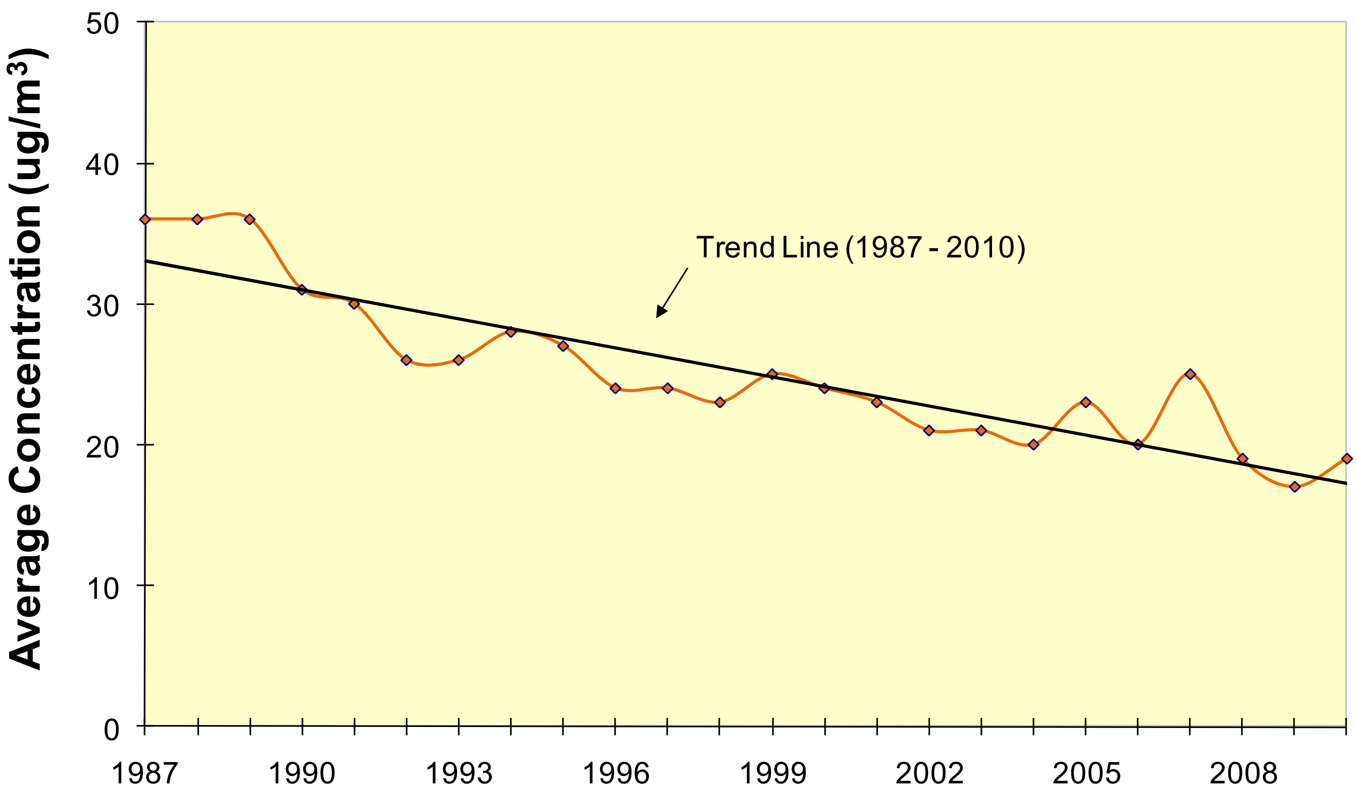


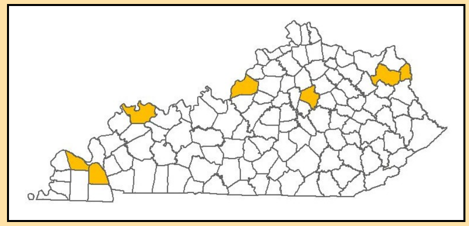
Figure 43: Statewide averages for PM_{10} monitoring indicate pollution reductions.

National Ambient Air Quality Standards for Particulate Matter (PM_{10})

Primary NAAQS: **Maximum 24-hour concentration not to exceed150 $\mu g/m^3$ more than once per year on average over 3 years**

Secondary NAAQS: **Same as Primary Standard**

Criteria Pollutant Summary Report – 2010



Pollutant: **Particulate Matter PM_{10}**
Method: Gravimetric
Data Interval: 24-hour
Units: Micrograms per cubic meter ($\mu g/m^3$) (25°C)

County	Site	AIRS-ID	# Obs	Mean	24-hour Average				
					Obs >150	1st max	2nd max	3rd max	4th max
Boyd	122 22nd Street Ashland	21-019-0002	57	30.2	0	94	90	70	61
Carter	Camp Webb Grayson Lake	21-043-0500	57	13.4	0	39	27	24	23
Fayette	533 South Limestone Lexington	21-067-0014	58	19.1	0	37	35	35	34
Henderson	Baskett Fire Dept. Baskett	21-067-0014	59	19.4	0	37	37	36	32
Jefferson[1]	37th & Southern Ave Louisville	21-111-0043	8199	22.2	0	79	74	58	56
Jefferson[1]	1032 Beecher Avenue Louisville	21-111-0044	7991	20.8	0	67	51	51	50
McCracken	342 Lone Oak Road Paducah	21-145-1004	57	17.4	0	40	32	29	28
Marshall	24 Main Street Calvert City	21-157-0018	57	17.1	0	33	30	29	27
Ohio	Keytown Road Echols	21-183-0032	26	15.3 *	0	24	24	23	23

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.

2010 Sulfur Dioxide Ambient Air Monitoring Network

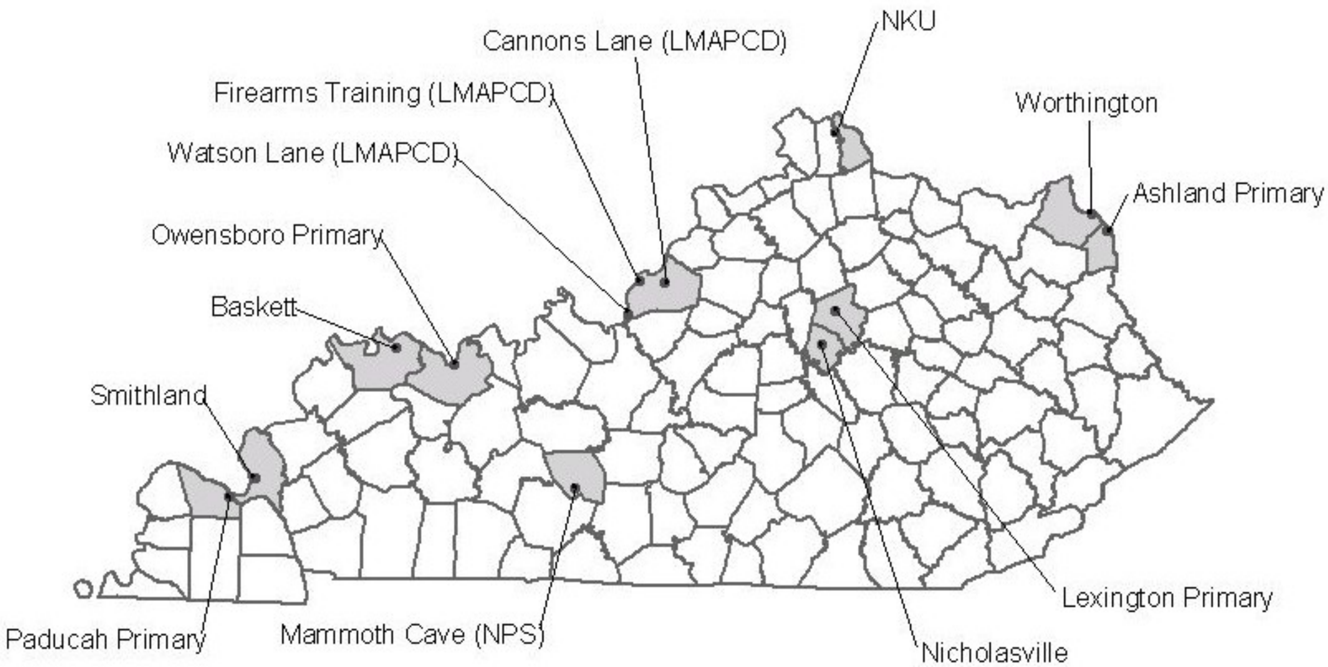


Figure 44: Sulfur dioxide monitoring locations in Kentucky

Sulfur dioxide (SO_2) is a colorless gas that has a pungent odor at concentrations exceeding 0.5 ppm. SO_2 is produced by the combustion of sulfur containing fuels, ore smelting, petroleum processing and the manufacture of sulfuric acid. Nationwide, coal-fired power plants are the largest sources of SO_2. Other industrial sources include petroleum refineries and paper mills.

Environmental Impacts

The primary health effect of exposure to SO_2 is the aggravation of pre-existing respiratory, cardiovascular, and pulmonary disease. Asthmatics, children, and the elderly are especially susceptible to the effects of SO_2 pollution. SO_2 can also damage the foliage of trees and agricultural crops.

Moisture in the atmosphere combines with SO_2 to form sulfuric acid (H_2SO_4), which is a component of acid precipitation. Acid precipitation causes acidification of soil and water that can deteriorate plant life, animal life, and structural surfaces.

SO_2 may also be converted into sulfates. Sulfates are significant components of $PM_{2.5}$ and regional haze. Regional haze has been attributed to poor visibility at many of the vistas in our national parks, including Mammoth Cave National Park in Kentucky and the Great Smoky Mountains in Tennessee.

How is SO_2 monitored?

Analyzers continuously monitor SO_2 by using the ultraviolet (UV) fluorescence method. Fluorescent analyzers irradiate an ambient air sample with ultraviolet light. SO_2 molecules absorb a portion of this energy and then re-emit the energy at a characteristic wavelength of light. The light energy emitted by the SO_2 molecules is proportional to the concentration of SO_2 present in the sample. A photo multiplier cell measures the light emitted and converts it to a parts per million measurement.

Data from the analyzer is transmitted into an automated data storage system. In 2010, the division, the NPS at Mammoth Cave, and LMAPCD operated 13 SO_2 monitors in Kentucky.

Results

On June 22, 2010, the EPA promulgated a new primary SO_2 NAAQS. The NAAQS was set to 75 ppb, measured as the three-year average of the 99^{th} percentile of the daily maximum one-hour averages. The EPA revoked the original 24-hour and annual NAAQS standards.

One Louisville site exceeded the new primary NAAQS in 2010. Prior to the establishment of the new NAAQS, the last exceedance of an SO_2 standard occurred in November 1981, when the monitor at a Louisville site (21-111-0032) recorded a 24-hour average of 0.159 ppm.

Statewide and regional sulfur dioxide levels have declined over the past twenty years. The SO_2 allowances component of the Acid Rain Program provides an opportunity for electrical utilities to participate in a market-based trade of SO_2 emissions. An electric utility, that is participating in the trading program, is required to continually monitor emissions for SO_2, NO_x, and any other pollutants. The continuous monitoring of the emissions provides compliance data and credibility to the trading program. The trading allowances in the Acid Rain program have directly contributed to the decline in ambient SO_2 concentrations.

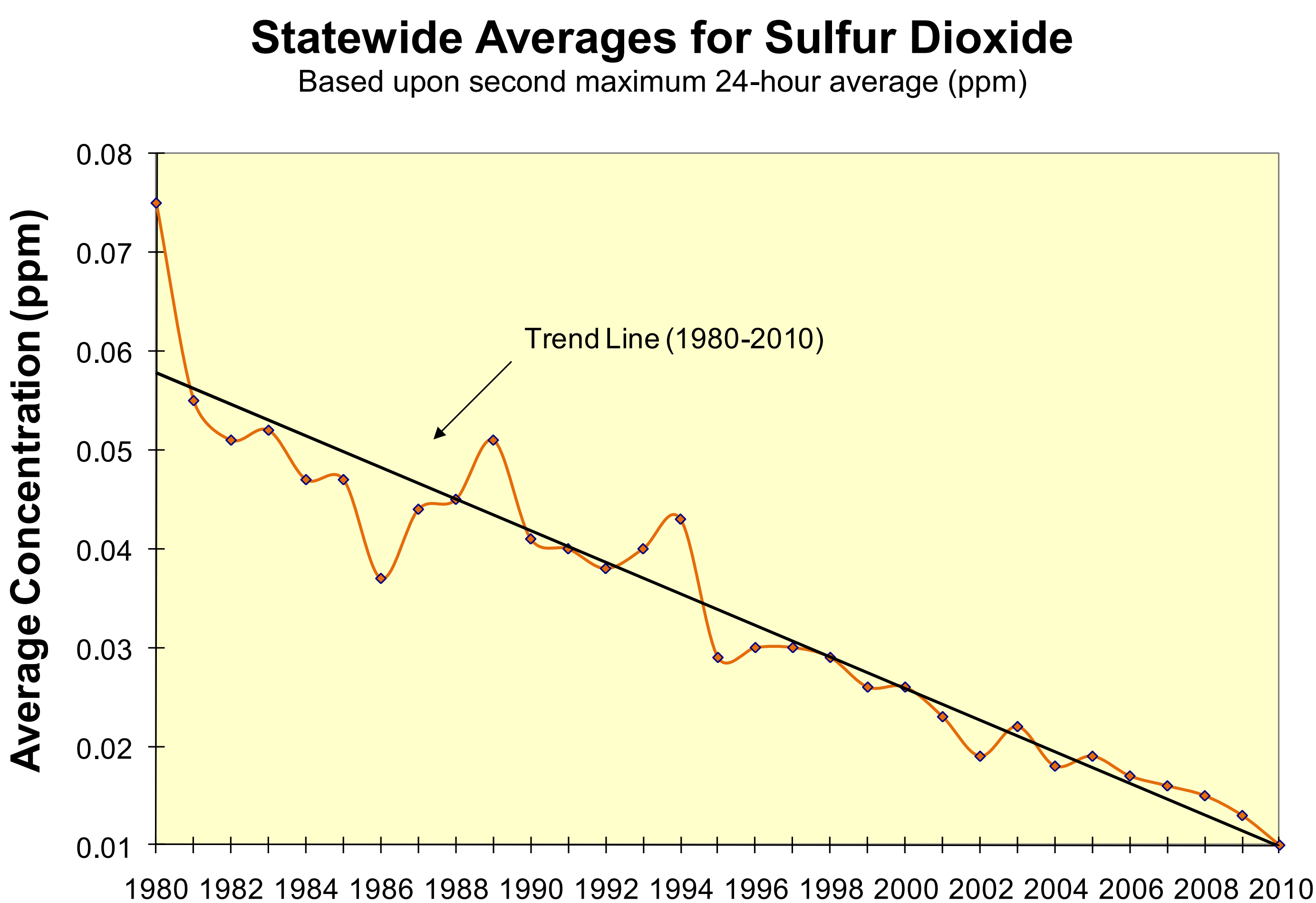


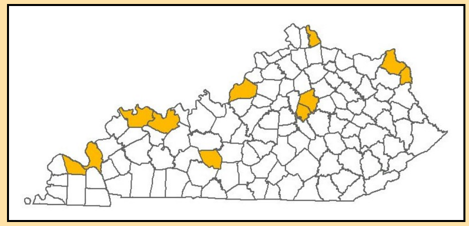
Figure 45: Statewide averages for SO_2 monitoring indicate pollution reductions.

National Ambient Air Quality Standards for Sulfur Dioxide

Primary NAAQS: **3-year average of the 99^{th} percentile of the daily maximum 1-hour aver age not to exceed 75 ppb**

Secondary NAAQS: **3-hour concentrations not to exceed 0.5 ppm more than once per year**

Criteria Pollutant Summary Report – 2010



Pollutant: **Sulfur Dioxide**
Method: Instrumental
Ultra-Violet Fluorescence
Data Interval: Hourly
Units: Parts-per-billion (ppb)

County	Site Address	AQS-ID	# Obs	Annual Mean	Daily Maximum 1-Hr Average (ppb)				
					1^{st} max	2^{nd} max	3^{rd} max	4^{th} max	Obs > 75
Boyd	2924 Holt Street Ashland	21-019-0017	8632	2.33	53	48	38	34	0
Campbell	524A John Hill Rd Highland Heights	21-037-3002	8629	4.03	142	118	105	99	5
Daviess	US 60 and Pleasant Valley Rd, Owensboro	21-059-0005	8675	2.84	92	81	70	68	2
Edmonson[1]	Alfred Cook Road Mammoth Cave	21-061-0501	7967	1.27	17.1	15.7	15.4	15.2	0
Fayette	650 Newtown Pike Lexington	21-067-0012	8679	2.21	57	49	42	40	0
Greenup	Scott & Center Streets Worthington	21-089-0007	8568	2.50	53	53	49	41	0
Henderson	Baskett Fire Dept Baskett	21-101-0014	8673	2.05	35	26	23	22	0
Jefferson[2]	7201 Watson Lane Louisville	21-111-0051	8695	4.06	134	112	108	107	16
Jefferson[2]	2730 Cannons Lane Louisville	21-111-0067	5055	2.49 *	91	55.8	45	37.6	1
Jefferson[2]	4201 Algonquin Pkwy Louisville	21-111-1041	8533	3.13	144	123	117	100	6
Jessamine	KYDOT, Etter Drive Nicholasville	21-113-0001	8290	2.05	108	66	54	48	1
Livingston	DOT Garage, US 60 Smithland	21-139-0003	8455	0.92	20	16	16	15	0
McCracken	2901 Powell Street Paducah	21-145-1024	8638	1.48	52	36	26	25	0

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
Values in red are a visual representation of an exceedance of the NAAQS.

SO_2 Criteria Pollutant Multi-Year Summary Report – 2010
Daily Maximum 1-hour 99th Percentile, 3-Year Average

County	Site Address	AQS-ID	Daily Maximum 1-Hr Average, 99th Percentile (ppb)				
			2008	2009	2010	3-Year Avg	Obs > 75
Boyd	2924 Holt Street Ashland	21-019-0017	45	28	34	36	0
Campbell	524A John Hill Rd Highland Heights	21-037-3002	52	60	99	70	1
Daviess	US 60 and Pleasant Valley Rd, Owensboro	21-059-0005	61 *	43	68	57 *	0
Edmonson[1]	Alfred Cook Road Mammoth Cave	21-061-0501	n/a	9 *	15	12 *	0
Fayette	650 Newtown Pike Lexington	21-067-0012	35	42	40	39	0
Greenup	Scott & Center Streets Worthington	21-089-0007	35	28	41	35	0
Henderson	Baskett Fire Dept Baskett	21-101-0014	72	26	22	40	0
Jefferson[2]	7201 Watson Lane Louisville	21-111-0051	113	116	107	112	3
Jefferson[2]	2730 Cannons Lane Louisville	21-111-0067	n/a	n/a	45 *	45 *	0
Jefferson[2]	4201 Algonquin Pkwy Louisville	21-111-1041	122	96	100	106	3
Jessamine	KYDOT, Etter Drive Nicholasville	21-113-0001	55	47	48	50	0
Livingston	DOT Garage, US 60 Smithland	21-139-0003	19 *	16	15	17 *	0
McCracken	2901 Powell Street Paducah	21-145-1024	26	25	25	25	0

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
Values in red are a visual representation of an exceedance of the NAAQS.

Mercury (Ambient Air and Wet Deposition) Monitoring Network

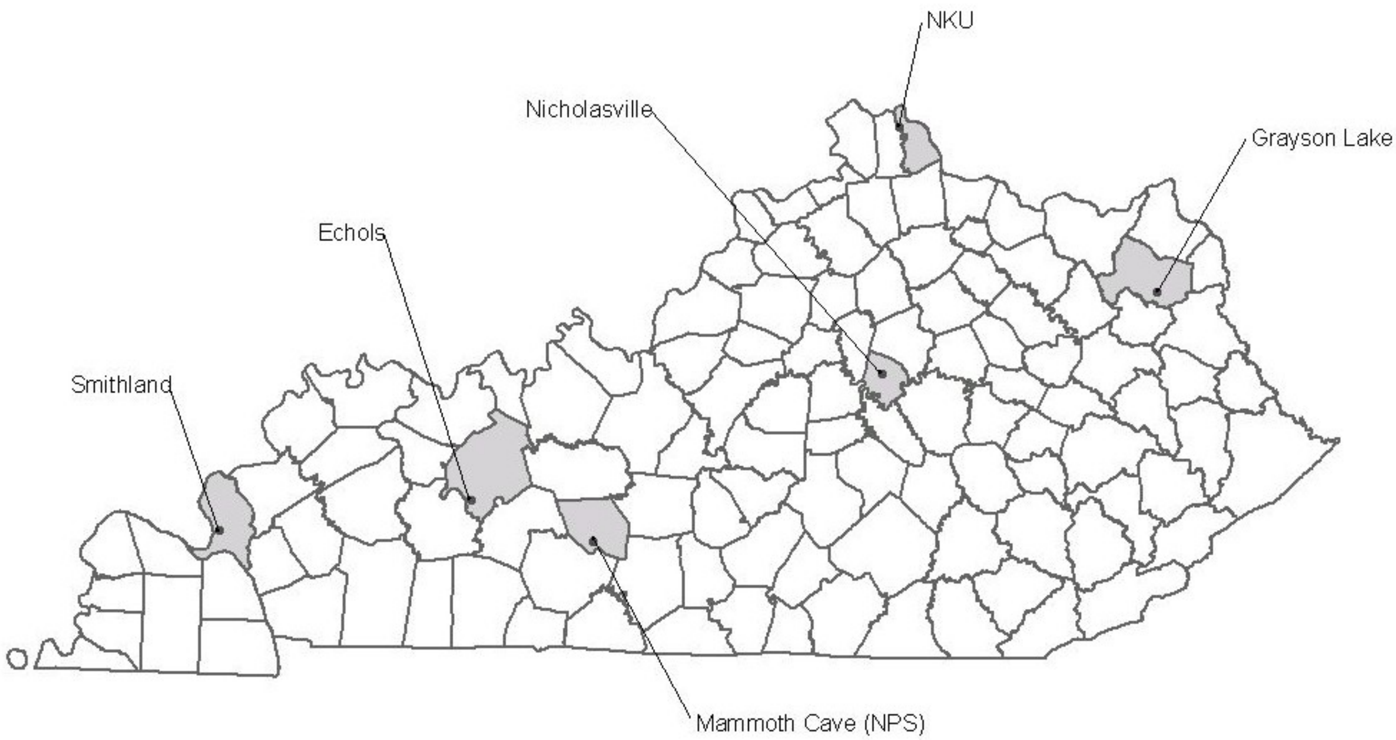


Figure 46: Mercury monitoring locations in Kentucky.

Mercury (Hg) is a naturally occurring element that is found in air, water, and soil. Mercury exists in several different forms: elemental, inorganic, and organic. Elemental mercury is a shiny, silver-white metal that is in a liquid state at room temperature. Elemental mercury is used in thermometers, fluorescent lights, and electrical switches. Exposed elemental mercury can become an invisible, odorless toxic gas at room temperature.

Inorganic Hg compounds are found as mercury salts and typically have a white-powder or crystal appearance, except for mercuric sulfide (cinnabar), which is red. Inorganic Hg compounds are used in fungicides, antiseptics, disinfectants, skin lightening creams, and traditional medicines.

Organic mercury compounds are formed when mercury combines with carbon. The most common organic mercury compound found in the environment is methylmercury, a highly toxic form that builds up in fish, shellfish, and animals that eat fish. Methylmercury is formed when inorganic mercury, released into the air from the combustion of coal, settles into water or onto land where it can be washed into water and converted into organic mercury by microorganisms. Fish and shellfish are the main sources of methyl-mercury exposure to humans.

Environmental Impacts

Mercury exposure at high levels can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. Research has shown that most fish consumption does not cause an exposure to high levels of mercury in adults. However, it has been demonstrated that high levels of methylmercury in the bloodstream of unborn babies and young children may harm the developing nervous system.

Kentucky is one of 31 states that have issued a statewide fish consumption advisory due to unsafe levels of mercury. The advisory is for women of childbearing age and children six years and younger.

How is Hg monitored?

Mercury is monitored in Kentucky by two different collection methods. The first collection method is wet deposition monitoring. Wet deposition monitoring stations operate on a weekly sampling schedule. Cumulative precipitation events, occurring during a seven day period, are collected in one container to represent a one-week sample. An automatic wet precipitation collector is used to collect the sample. At the end of each weekly sampling period, the wet container is removed and replaced with a new, clean container for the next sampling period. After the sample is removed, field measurements of pH and conductivity are made and recorded. The remaining sample is then shipped to Frankfort where laboratory analysis is conducted to determine levels of mercury in the sample.

A second method of Hg collection is by the use of analyzers, which operate continuously, using Cold Vapor Atomic Fluorescence Spectrometry (CVAFS). The analyzer traps gaseous elemental mercury, from an air sample, into a cartridge containing an ultra-pure gold adsorbent. The amalgamated mercury is then thermally desorbed and detected using CVAFS.

Mercury is not a criteria pollutant—that is, DAQ is not currently required to monitor for mercury as part of the Clean Air Act.

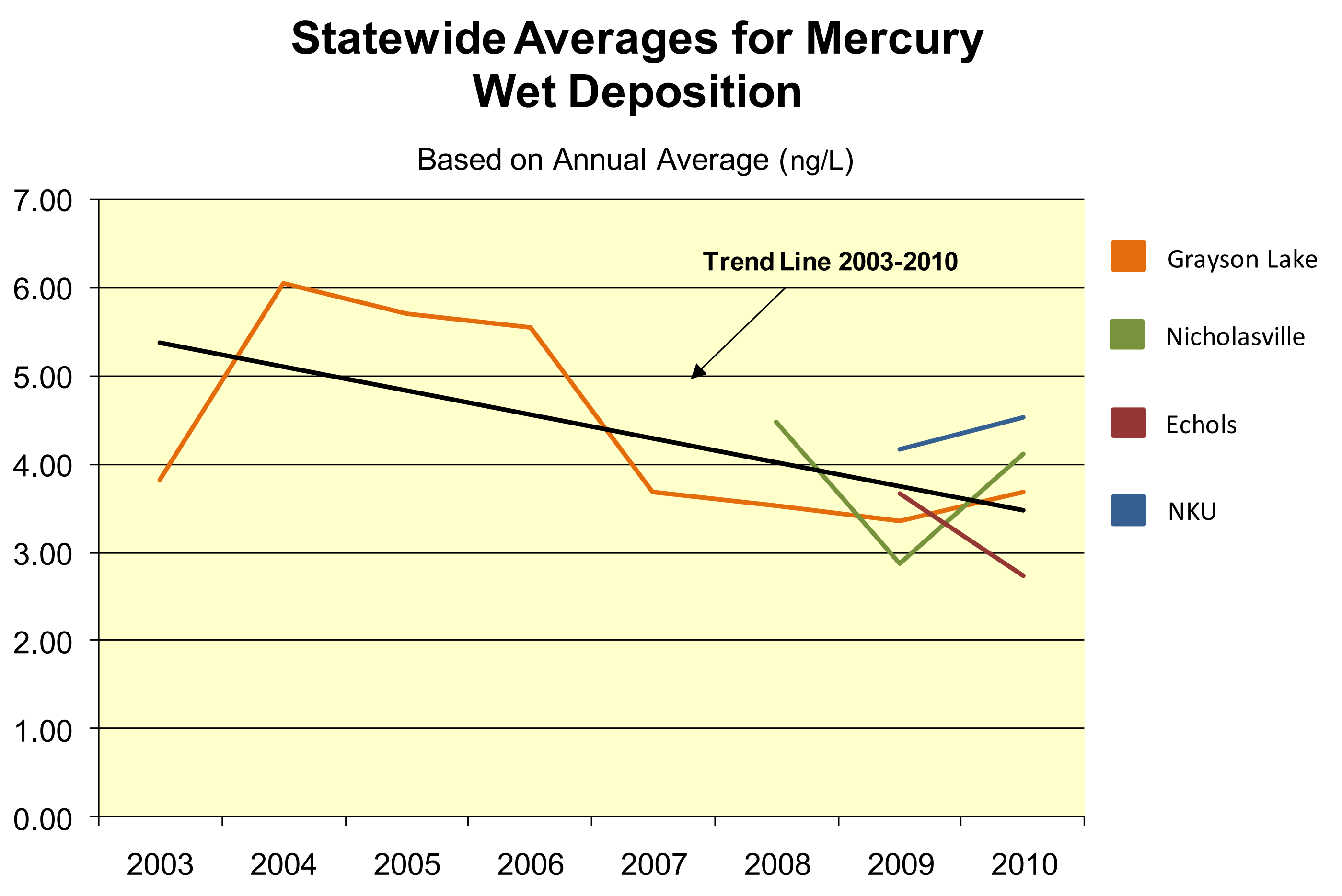


Figure 47: Statewide annual averages for mercury deposition.

In 2010, the division operated five continuous CVAFS mercury analyzers and four mercury wet deposition samplers. The NPS at Mammoth Cave National Park also operated one CVAFS mercury analyzer. In addition, Mammoth Cave operated a wet deposition sampler as a part of the Mercury Deposition Network, a component of the National Atmospheric Deposition Program (NADP).

CVAFS measurements indicate annual average ambient mercury concentrations from 0.9 to 1.3 ng/m^3. Average background mercury levels are generally considered to range from 1.0 to 3.0 ng/m^3. Average wet deposition measurements ranged from 2.71 to 4.53 ng/L, which are below the level expected when compared to NADP isopleth maps.

The division had intended to correlate mercury data with fish tissue samples from around the state, despite a lack of federally established standards for comparative analysis of mercury levels. However, since the inception of monitoring in 2003, CVAFS continuous analyzers have not been able to measure concentrations above background levels. During the 2010 monitoring year, the division made the decision to shut-down the ambient mercury network due to budget constraints and an inability to purchase speciation-unit attachments for the CVAFS analyzers. Mercury speciation units may have allowed the CVAFS analyzers to measure gaseous-oxidized and particle-bound mercury species, in addition to gaseous-elemental mercury. Since wet deposition data works in concert with continuous CVAFS monitoring, mercury wet deposition was also discontinued. The division continues to research new technologies and, as budget allows, may re-establish mercury monitoring in the State. NADP mercury deposition sampling will continue uninterrupted at Mammoth Cave National Park.

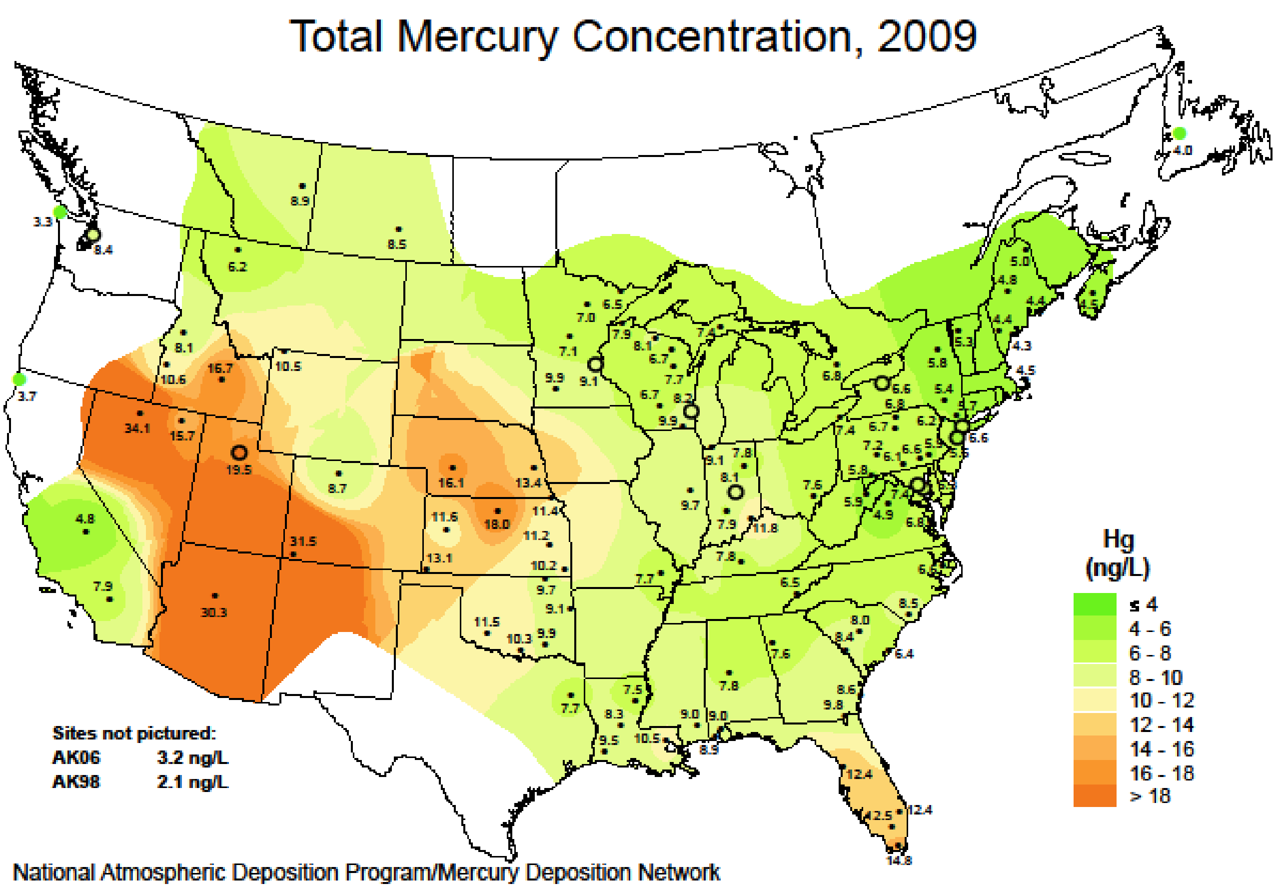
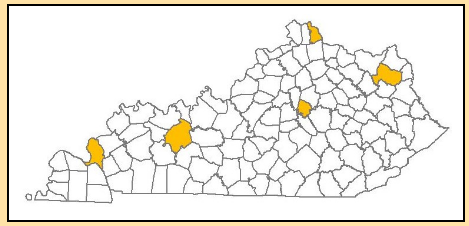


Figure 48: The mercury isopleth map indicates that mercury deposition concentrations in Kentucky are at moderate levels compared to the South and North East regions of the United States. Map courtesy of the National Atmospheric Deposition Program.

Wet Deposition Mercury Pollutant Summary Report – 2010

Pollutant: **Mercury**
Method: Wet Deposition
Data Interval: Weekly
Units: Nanograms per liter (ng/L)

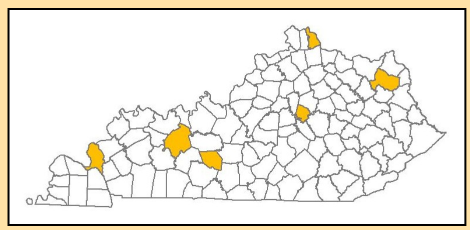


County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Campbell	524A John Hill Highland Heights	21-037-3002	12	4.53 *	11.20	9.25	9.12	3.64
Carter	Camp Webb Grayson Lake	21-043-0500	15	3.69 *	8.06	7.75	5.91	5.41
Jessamine	KYDOT, Etter Drive Nicholasville	21-113-0001	32	4.11	9.65	9.12	7.84	7.71
Ohio	Keytown Road Echols	21-183-0032	11	2.74 *	4.32	4.17	3.49	2.99

* Incomplete data set.

Continuous Mercury Pollutant Summary Report – 2010

Pollutant: **Mercury**
Method: Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)
Data Interval: Hourly
Units: Nanograms per cubic meter (ng/m^3)



County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Campbell	524A John Hill Highland Heights	21-037-3002	7581	1.3	5.6	5.5	4.5	4.4
Carter	Camp Webb Grayson Lake	21-043-0500	7667	1.1	2.2	2.1	1.9	1.9
Edmonson[1]	Alfred Cook Road Mammoth Cave	21-059-0005	7692	0.9	1.8	1.8	1.7	1.6
Jessamine	KYDOT, Etter Drive Nicholasville	21-113-0001	8107	1.0	3.3	3.0	2.9	2.7
Livingston	DOT Garage, US 60 Smithland	21-139-0003	7650	1.1	3.0	2.7	2.4	2.4
Ohio	Keytown Road Echols	21-183-0032	2737	1.1 *	1.8	1.7	1.7	1.7

[1] Monitor operated by the National Park Service.
* Incomplete data set.

Wet deposition (sometimes referred to as “acid rain”) is a classification of pollutants that are precipitation borne. Snow, sleet, hail, rain, or fog can combine with pollutants in the atmosphere and fall to earth as harmful acidic compounds. Acidified rainwater may contain combinations of sulfuric and nitric acids that form when water vapor, sulfur dioxide, and nitrogen oxides react.

Major sources of sulfur dioxide include power plants, paper and wood pulp processing plants, and facilities with coal fired boilers. Nitrogen oxides are produced primarily from the combustion of fossil fuels in the engines of cars and trucks, as well as from power plant emissions.

Aquatic life appears to be most sensitive to the effects of acidic precipitation. Small changes in the pH levels of lakes and streams may prevent some fish species and other aquatic life forms from reproducing. Many insects cannot survive in acidic waters; therefore, birds and mammals that depend on insects for food may suffer abnormally high mortality rates.

Acidic precipitation can also alter soil chemistry and nutrient availability, in turn weakening trees and shrubs and causing them to be more vulnerable to insects, diseases, and fungus infestations. Acid precipitation may also damage agricultural crops and has been blamed for deterioration of monuments and building surfaces.

Wet deposition monitoring stations operate on a weekly sampling schedule. Cumulative precipitation events occurring during a seven day period are collected in one container to represent a one-week sample. An automatic wet/dry precipitation collector is used to collect the sample. The sampler consists of two collection containers. The “wet” container is fitted with a clean plastic sample bag for collection of precipitation. The “dry” container, designed for dry particulate collection is not presently utilized for sample collection. The sampler employs a moisture sensor, which activates an electrically driven movable container lid that covers the wet container during dry periods and then moves to cover the dry container when precipitation occurs.

At the end of each weekly sampling period, the wet container is removed and replaced with a new, clean container for the next sampling period. After the sample is removed, field measurements of pH and conductivity are made and recorded. The remaining sample is then shipped to Frankfort where laboratory analysis is conducted to determine levels for pH, conductivity, acidity, sulfates, nitrates, phosphates, ammonia, and metal ions.

In 2010, the DAQ operated one acid rain site at Grayson Lake State Park. The NPS at Mammoth Cave also operated a wet deposition sampler, as a part of the National Atmospheric Deposition Program (NADP). In total, Kentucky hosts six NADP sites.

Results

Annual pH averages for both Grayson Lake and Mammoth Cave have shown modest upward trends since 1986.

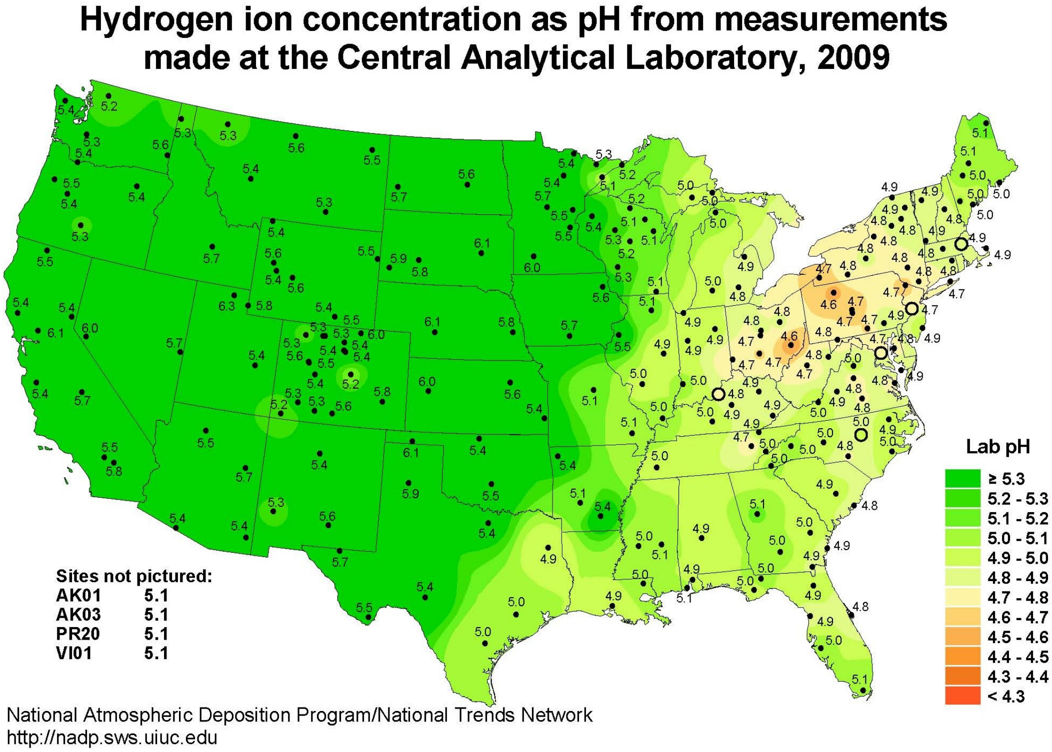
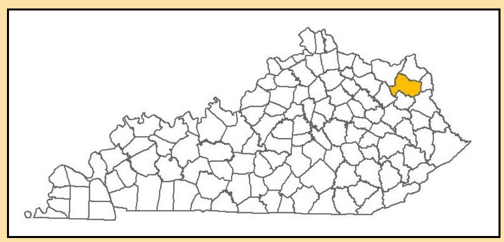


Figure 49: The pH isopleth map indicates that rainfall is more acidic in the East and Northeast regions of the United States, but monitoring has shown a decrease in acidity levels over time due to reductions in sulfur dioxide and nitrogen oxides. Map courtesy of the National Atmospheric Deposition Program.

Kentucky Division for Air Quality
Wet Deposition Pollutants Summary Report - 2010



Location: **Grayson Lake, KY** – Camp Webb
Site Id: 21-043-0500
County: Carter
Method: Wet Collector, Laboratory Analytical

Parameter	Units	# Obs	Arithmetic Mean	1st Max	2nd Max	3rd Max	4th Max
Acidity	Mg/L as $CaCO^3$	29	2.12	7.02	6.50	594	5.50
Ammonium	Mg/L	31	0.27	1.09	0.79	0.46	.045
Calcium	Mg/L	30	0.21	1.19	0.56	0.51	0.51
Chloride	Mg/L	31	0.15	1.02	0.28	0.26	0.23
Conductivity	US/cm	30	4.46	13.76	10.82	9.70	9.11
Magnesium	Mg/L	31	0.22	6.50	ND	ND	ND
Nitrate	Mg/L	31	0.86	1.75	1.51	1.35	1.35
pH	pH Units	22	5.12	6.87	5.60	5.45	5.39
Potassium	Mg/L	31	0.09	1.78	0.38	0.32	ND
Sodium	Mg/L	31	0.28	5.20	1.13	0.70	0.28
Sulfate	Mg/L	30	1.09	2.26	1.86	1.81	1.76

ND= Non-Detect

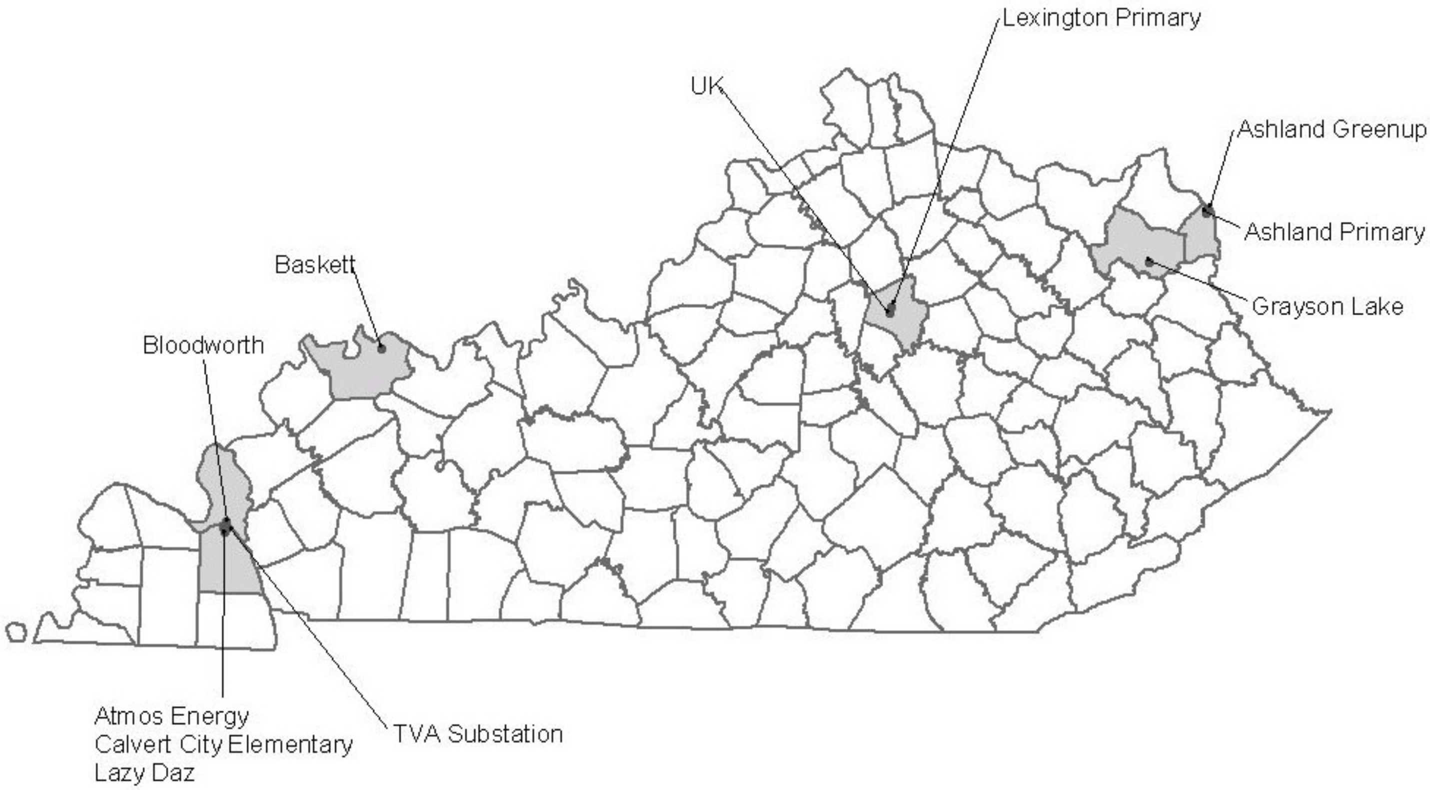


Figure 50: Hazardous air pollutant monitoring locations in Kentucky.

Hazardous air pollutants (HAPs) include 187 substances known or suspected to cause neurological, immunological, reproductive, and respiratory disorders, as well as known or suspected human carcinogens. The ultimate goal of the EPA is to eliminate unacceptable risks of cancer, other significant health problems from exposures to air toxics emissions and to substantially reduce or eliminate adverse effects on our natural environment. To provide a basis for decision-making with respect to these matters, the EPA developed the National Air Toxics Trends Stations (NATTS) monitoring network.

In 2003, the EPA designated the Division for Air Quality's Hazard air monitoring site part of that network. The Hazard site was in the Rural Trends Network, and along with its Urban Trends counterpart, was established to provide toxics trends data on a national basis. Data generated by these monitors are needed to understand the behavior of air toxics in the atmosphere and to develop control strategies.

In June 2008, the Hazard NATTS monitoring station was discontinued and moved to Carter County, Kentucky. The new NATTS site is located at the division's Grayson Lake site. Grayson Lake is in a rural setting and meets the criteria for a rural NATTS location.

In 2010, the division operated 11 hazardous air pollutant stations throughout the Commonwealth using the NATTS monitoring objectives; however, only samplers operated at Grayson Lake are a part of the NATTS network. The EPA has identified 19 required hazardous air pollutants that are to be monitored in the National Air Toxics Trends study.

HAPS can be subdivided into five monitoring groups: carbonyls, metals, volatile organic compounds (VOC), polyaromatic hydrocarbons (PAH), and hexavalent chromium (Cr^{6+}). The compounds are sampled using the following media:

- Carbonyls: Dinitrophenylhydrazine (DNPH) adsorbent cartridges
- PM_{10} metals: Teflon® filters
- VOCs: passivated SUMMA canisters
- PAHs: polyurethane foam (PUF)/XAD-2® sorbent
- Cr^{6+}: Bicarbonate-impregnated ashless cellulose filter

The samplers operate for 24-hours on every sixth day or every twelfth day. Carbonyl and PM_{10} metals samples are sent to the Environmental Services Branch (ESB) laboratory for analysis. PAH and Cr^{6+} samples are sent to an EPA national contract laboratory for analysis. VOC samples associated with the NATTS site were also analyzed by the EPA national contract laboratory, while VOC samples from other sites were analyzed by the ESB laboratory.

Results

DAQ is currently establishing a baseline for future trends analysis of HAPs. The data indicates that several of the monitored twenty-three hazardous air pollutants are present in Kentucky's ambient air.

Potential sources may be large industrial sources in the immediate area, mobile emissions (cars, trucks and school buses), and small local source emissions such as those from fueling stations, body shops/painting, dry cleaners, asphalt plants, etc.

For more information about air toxics in Kentucky, see the Permit Review Branch section of this report.

Carbonyls

Air Toxics Summary Report - 2010

Pollutant: Acetaldehyde
Method: TO-11A; Carbonyl sampler with DPNH cartridges
Data Interval: 24-hour
Units: Micrograms per cubic meter (μg/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	2924 Holt Street Ashland	21-019-0017	59	1.48	4.64	3.05	3.03	2.75
Carter	Camp Webb Grayson Lake	21-143-0500	60	0.76	1.57	1.55	1.54	1.52
Fayette	650 Newtown Pike Lexington	21-067-0012	58	1.33	3.89	2.95	2.53	2.36
Kenton	1401 Dixie Highway Covington	21-117-0007	26	1.42 *	2.45	2.37	2.23	2.14

* Incomplete data set.

Air Toxics Summary Report - 2010

Pollutant: Formaldehyde
Method: TO-11A; Carbonyl sampler with DPNH cartridges
Data Interval: 24-hour
Units: Micrograms per cubic meter (μg/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	2924 Holt Street Ashland	21-019-0017	59	2.65	7.23	4.17	4.06	3.82
Carter	Camp Webb Grayson Lake	21-143-0500	60	1.48	3.15	2.84	2.77	2.67
Fayette	650 Newtown Pike Lexington	21-067-0012	58	2.88	7.19	6.81	6.67	6.28
Kenton	1401 Dixie Highway Covington	21-117-0007	26	2.42 *	4.93	4.80	3.57	3.31

* Incomplete data set.

Air Toxics Summary Report - 2010

Pollutant: Antimony

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Carter	Camp Webb Grayson Lake	21-043-0500	58	0.7	4.19	2.51	2.19	1.92

Air Toxics Summary Report - 2010

Pollutant: Arsenic

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	57	2.1	7.25	7.21	6.95	6.20
Carter	Camp Webb Grayson Lake	21-143-0500	58	0.6	1.25	1.23	1.23	1.16
Fayette	533 South Limestone Lexington	21-067-0014	58	1.2	5.71	4.83	2.91	2.72
Marshall	24 Main St Calvert City	21-157-0018	56	0.6	1.67	1.49	1.46	1.29
Ohio	Keytown Road Echols	21-183-0032	26	0.5 *	1.61	1.16	1.08	1.04

* Incomplete data set.

Air Toxics Summary Report - 2010

Pollutant: Beryllium

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	57	0.0	ND	ND	ND	ND
Carter	Camp Webb Grayson Lake	21-143-0500	58	0.0	ND	ND	ND	ND
Fayette	533 South Limestone Lexington	21-067-0014	58	0.0	ND	ND	ND	ND
Marshall	24 Main St Calvert City	21-157-0018	56	0.0	ND	ND	ND	ND
Ohio	Keytown Road Echols	21-183-0032	26	0.0 *	ND	ND	ND	ND

ND=Non detect
* Incomplete data set.

Air Toxics Summary Report - 2010

Pollutant: Cadmium

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	57	0.5	4.69	1.68	1.59	1.45
Carter	Camp Webb Grayson Lake	21-143-0500	58	0.0	ND	ND	ND	ND
Fayette	533 South Limestone Lexington	21-067-0014	58	0.0	ND	ND	ND	ND
Marshall	24 Main St Calvert City	21-157-0018	56	0.0	0.47	0.44	ND	ND
Ohio	Keytown Road Echols	21-183-0032	26	0.0 *	0.31	0.22	0.22	0.05

ND=Non detect
* Incomplete data set.

Air Toxics Summary Report - 2010

Pollutant: Chromium

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	57	1.3	7.62	5.03	4.04	3.97
Carter	Camp Webb Grayson Lake	21-143-0500	58	0.0	ND	ND	ND	ND
Fayette	533 South Limestone Lexington	21-067-0014	58	0.1	0.94	0.70	0.49	0.37
Marshall	24 Main St Calvert City	21-157-0018	56	0.0	0.17	ND	ND	ND
Ohio	Keytown Road Echols	21-183-0032	26	0.0 *	0.31	0.22	0.22	0.05

ND=Non detect
* Incomplete data set.

Air Toxics Summary Report - 2010

Pollutant: Lead

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	57	14.2	53.6	47.6	36.5	34.5
Carter	Camp Webb Grayson Lake	21-143-0500	58	2.4	15.4	8.08	5.58	5.09
Fayette	533 South Limestone Lexington	21-067-0014	58	3.9	13.0	12.2	10.1	10.0
Marshall	24 Main St Calvert City	21-157-0018	56	2.5	18.2	5.23	4.81	4.53
Ohio	Keytown Road Echols	21-183-0032	26	1.9 *	5.20	3.80	3.73	2.88

* Incomplete data set.

Air Toxics Summary Report - 2010

Pollutant: Manganese

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	57	23.5	267	100	77.6	65.9
Carter	Camp Webb Grayson Lake	21-143-0500	60	3.3	15.3	15.0	11.8	9.94
Fayette	533 South Limestone Lexington	21-067-0014	58	4.9	17.3	12.3	11.1	11.0
Marshall	24 Main St Calvert City	21-157-0018	56	5.8	17.0	16.1	14.7	11.7
Ohio	Keytown Road Echols	21-183-0032	26	2.6 *	6.68	5.04	4.94	4.95

* Incomplete data set.

Air Toxics Summary Report - 2010

Pollutant: Nickel

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	57	2.1	11.8	9.83	6.66	6.59
Carter	Camp Webb Grayson Lake	21-143-0500	58	3.4	0.417	0.415	0.412	0.407
Fayette	533 South Limestone Lexington	21-067-0014	58	0.7	3.22	3.17	2.48	1.98
Marshall	24 Main St Calvert City	21-157-0018	56	0.3	5.84	3.45	0.798	0.736
Ohio	Keytown Road Echols	21-183-0032	26	0.2 *	1.81	1.39	0.740	0.675

* Incomplete data set.

Volatile Organic Compounds

Air Toxics Summary Report - 2010

Site: Camp Webb-Grayson Lake, Boyd County
AQS ID: 21-043-0500
Method: TO-15; Passivated SUMMA Canister
Data Interval: 24-hour
Units: Parts per billion (ppb)

Pollutant	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Benzene	35	0.227	1.390	0.614	0.339	0.327
1,3-Butadiene	35	0.014	0.045	0.034	0.028	0.026
Carbon tetrachloride	35	0.102	0.143	0.136	0.127	0.126
Chloroform	35	0.016	0.031	0.031	0.026	0.022
1,2 Dichloropropane	35	0.000	ND	ND	ND	ND
cis-1,3 Dichloropropene	35	0.000	ND	ND	ND	ND
trans-1,3 Dichloropropene	35	0.000	ND	ND	ND	ND
Ethylene dibromide	35	0.000	ND	ND	ND	ND
Ethylene dichloride	35	0.000	ND	ND	ND	ND
Methylene chloride	35	0.000	ND	ND	ND	ND
Tetrachloroethylene	35	0.004	0.014	0.013	0.012	0.012
1,1,2,2 Tetrachloroethane	35	0.000	ND	ND	ND	ND
Trichloroethylene	35	0.000	ND	ND	ND	ND
Vinyl chloride	35	0.000	ND	ND	ND	ND

ND=Non detect

Polyaromatic Hydrocarbons

Air Toxics Summary Report - 2010

Site: Camp Webb-Grayson Lake, Boyd County

AQS ID: 21-043-0500

Method: TO-13; PUF-ZAD2 GC-MS

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

Pollutant	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Napthalene	60	22.71	78.0	62.5	52.5	50.6
Benzo(a)pyrene	60	0.06	0.51	0.35	0.35	0.21

Hexavalent Chromium

Air Toxics Summary Report - 2010

Site: Camp Webb-Grayson Lake, Boyd County

AQS ID: 21-043-0500

Method: Ashless cellulose filters; IC UV-VIS

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

Pollutant	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Hexavalent Chromium	61	0.01	0.0399	0.0312	0.0306	0.0282

APPENDIX A: REGIONAL FIELD OFFICE MAP

Division for Air Quality
Regional Office Boundaries

air.ky.gov

Environmental Emergency, 24-hour; (502) 564-2380 or (800) 928-2380
Open burn complaints: 888-BURNLAW (888-287-6529)

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Revised: 09/01/11

APPENDIX B: GLOSSARY OF TERMS

Analyte A chemical substance that is the subject of chemical analysis.

Anion A negatively-charged particle, having more electrons than protons.

Asbestos Hazard Emergency Response Act AHERA requires schools to inventory their asbestos materials and document strategies for dealing with these materials.

Air Toxics See Toxic Air Pollutant.

Ambient air quality The level of pollution present in the air outside.

Attainment When an area meets the national air quality standard set by the federal EPA for a particular pollutant.

Cation A positively-charged particle, having more protons than electrons.

Chemiluminescence The emission of light by a substance as a result of a chemical reaction that does not involve an increase in its temperature.

Clean Air Act Federal clean air program established by Congress in 1963.

Class I Area Areas of special natural, scenic, or historic importance are known as "Class 1 Areas," and are protected to maintain long distance, panoramic views.

Criteria Pollutant A regulated air pollutant. Currently, there are six criteria pollutants under the Clean Air Act. They are carbon monoxide, lead, ozone, particulate matter, nitrogen oxides and sulfur dioxide.

Emissions Inventory A list of sources of air contaminants, containing for each source the amount of each contaminant emitted.

Exceedance (of NAAQS) One occurrence of a measured or modeled concentration that exceeds the specified concentration level of a NAAQS for the averaging period specified by that standard.

Hazardous Air Pollutant Any pollutant listed in Subsection B of Section 112 of the Clean Air Act.

Inspection A scheduled determination of compliance with an existing regulation.

Investigation A complaint driven determination of compliance with an existing regulation.

National Ambient Air Quality Standards (NAAQS) Standards established by the United States Environmental Protection Agency (EPA) under authority of the Clean Air Act (42 U.S.C. 7401 et seq.) that apply for outdoor air throughout the country.

National Emissions Standards for Hazardous Air Pollutants NESHAP, with respect to asbestos, governs renovation and demolition activities and requires safe handling, removal (when applicable), and disposal of asbestos from facilities (everything except for single private homes).

Nonattainment When an area does not meet the National Ambient Air Quality Standard set by the U.S. EPA for a particular pollutant.

Notification Required reporting by facilities of regulated activities. For example, facilities are required to notify DAQ of certain air emission releases or upcoming asbestos disturbance (removal/demolition activities).

Primary Standard A National Ambient Air Quality Standard which establishes limits on specific criteria pollutants to protect public health, including the health of sensitive populations such as children, asthmatics, and the elderly.

Promulgate To officially announce, publish, make known to the public; to formally announce a statute or decision by the court.

Secondary Standard A National Ambient Air Quality Standard which establishes limits on specific criteria pollutants to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

Synthetic Minor A facility that has the PTE that could exceed major Title V thresholds, but they have agreed to control emissions below major threshold. Synthetic minors includes conditional major facilities.

Title V Any source that has the PTE of greater than 100 Tons of criteria pollutants or 10/25 TPY of a single HAP or any combined HAP.

Toxic Air Pollutant A subset of the pollutants listed as Hazardous Air Pollutants by the U.S. EPA.

APPENDIX C: GLOSSARY OF ABBREVIATIONS

AHERA Asbestos Hazard Emergency Response Act

AQI Air Quality Index

BACT Best Available Control Technology

CAA Clean Air Act

CO Carbon Monoxide

CO_2 Carbon Dioxide

CPT Cost per Ton

CSAPR Cross-State Air Pollution Rule

DAQ Division for Air Quality

DEP Department for Environmental Protection

DERA Diesel Emissions Reduction Act

EEC Energy and Environment Cabinet

EGU Electric Generating Unit

EPA Environmental Protection Agency

GHG Greenhouse Gas

HAP Hazardous Air Pollutant

HPV High Priority Violation

KORA Kentucky Open Records Act

LMAPCD Louisville Metropolitan Air Pollution Control District

LOW Letter of Warning

MACT Maximum Achievable Control Technology

NAAQS National Ambient Air Quality Standard

NATTS National Air Toxics Trends Stations

NESHAP National Emission Standard for Hazardous Air Pollutants

NO_x Nitrogen Oxides

NOV Notice of Violation

NPS National Park Service

O_3 Ozone

Pb Lead

PM_{10} Particulate Matter, also known as course particles, measure between 2.5-10 microns in diameter

$PM_{2.5}$ Fine Particulate Matter, also known as fine particles, measuring 2.5 microns in diameter

PTE Potential to Emit

QAPP Quality Assurance Project Plan

RATA Relative Accuracy Test Audit

SEDC Southeast Diesel Collaborative

SIP State Implementation Plan

SO_2 Sulfur Dioxide

SOP Standard Operating Procedure

TEMPO Tools for Environmental Management and Protection Organizations

TRI Toxics Release Inventory

VISTAS Visibility Improvement State and Tribal Association of the Southeast

VOC Volatile Organic Compound

ACKNOWLEDGEMENTS

Governor Steven L. Beshear **Secretary Leonard K. Peters**

This Annual Report is intended to provide a concise set of facts and measurements to support environmental decision-making. We welcome your questions and comments to the contacts below:

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