Office of Air Quality

STATE OF THE AIR 2019

Arkansas Department of
Energy and Environment
Division of Environmental Quality

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https://www.adeq.state.ar.us/air/forms/questions.aspx

In memory of Paul Hairston

DEQ Inspector, Fayetteville Area Office

FOREWORD

Dear Reader,

On behalf of the Office of Air Quality (OAQ) team, thank you for taking the time to read the 2019 State of the Air Report. Protecting the State's air quality is not only a benefit for the health of all Arkansans, but also important for preserving the great outdoors in a state that cherishes hunting, hiking, fishing, and other recreational activities. Two of our State's largest economic sectors, agriculture and tourism, benefit from the long-term improvements in air quality that are reflected in this report.

In every corner of the state, Arkansas's air quality meets health-based standards set by EPA for all criteria pollutants (six common outdoor air pollutants that can harm health, the environment, and property). Concentrations of these criteria pollutants are trending downward. Visibility trends in Arkansas scenic wilderness areas, particularly Caney Creek and Upper Buffalo Wilderness Areas, show continued improvement as emissions of visibility impairing pollutants are reduced.

I am proud of the work of each and every hard working public servant in OAQ, and the achievements in this report are a testament to that hard work. Because of the work of OAQ permit engineers, Arkansas is among the most efficient state agencies in speed of permit issuance. OAQ scientists and policy developers work to establish plans to ensure that air quality in Arkansas continues to meet the state's goals. Compliance and asbestos inspectors inspect regulated facilities and investigate complaints to assess compliance with air quality rules. Enforcement analysts work with the regulated community to expeditiously address areas of concern and bring regulated entities into compliance.

However, our work is far from done. OAQ will continue to work to provide efficient and responsive services to the public, to engage with our federal partners, and to work with stakeholders to protect and enhance the Natural State's air quality while fostering responsible economic growth.

Sincerely,

William K. Montgomery, J.D.
Interim Associate Director, Office of Air Quality

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List of Acronyms

APC&EC – Arkansas Pollution Control and Ecology Commission

AQI – Air Quality Index

CO – Carbon monoxide

CO2 – Carbon dioxide

DEQ – Division of Environmental Quality, within the Arkansas Department of Energy and Environment

EASE – Efficiency and Streamlining Effort

EPA – U. S. Environmental Protection Agency

FIP – Federal implementation plan

FFY – Federal fiscal year (in this report, October 1, 2018-September 30, 2019)

HAP – Hazardous air pollutants

NAAQS – National ambient air quality standards

NH3 – Ammonia

NOI – Notice of Intent

NOV – Notice of Violation

NOx – Nitrogen oxides

OAQ – Office of Air Quality, within the Division of Environmental Quality

PM10 – Coarse particulate matter

PM2.5 – Fine particulate matter

SAFER - State Agency Fleet Emissions Reductions

SIP – State implementation plan

SOx – Sulfur oxides

SO2 – Sulfur dioxide

VOCs – Volatile organic compounds

WRF – Weather research and forecasting

Introduction to the Office of Air Quality

Who We Are

The OAQ consists of four branches: Permits, Compliance, Policy and Planning, and Asbestos and Enforcement. Each branch of the OAQ has specific duties and addresses various aspects of the air program. The OAQ team is composed of scientists, engineers, inspectors, attorneys, and administrative professionals.

What We Do

- Develop and implement programs designed to ensure compliance with federal air quality regulations
- Regulate emissions through a permitting program that sets emission limits protective of public health
- Monitor ambient air quality in Arkansas through deployment and maintenance of a statewide monitoring network
- Investigate complaints and violations of State and federal air quality laws
- Prepare and issue air quality forecasts

BRANCHES

▲ PERMITS

The Permits Branch implements a single-permit system for new and modified facilities that encompasses both State and federal regulatory requirements for stationary sources.

▲ COMPLIANCE

The Compliance Branch investigates whether permitted facilities operate in accordance with State and federal air pollution regulations, as specified in each facility's permit. The Compliance Branch also investigates citizen complaints regarding air pollution and responds to emergency situations

▲ POLICY AND PLANNING

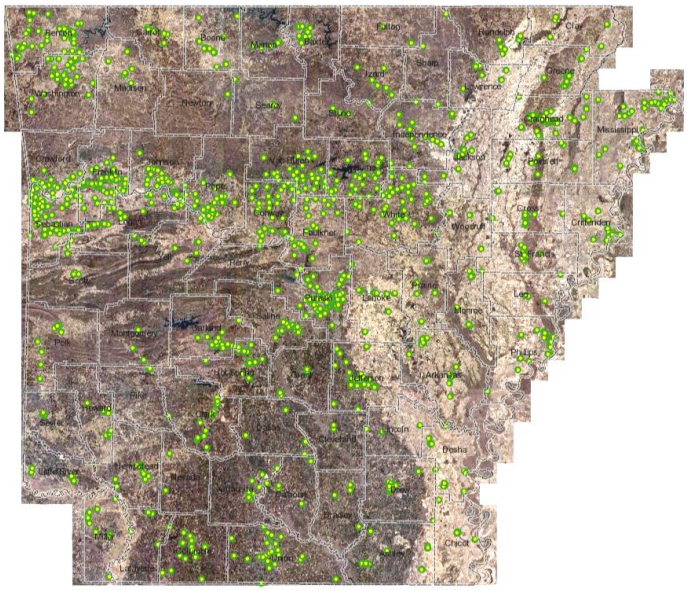
The Policy and Planning Branch is responsible for developing plans to comply with State statutes and federal air regulations. The Policy and Planning Branch also collects technical information on air quality and emissions of air pollutants.

▼ ASBESTOS AND ENFORCEMENT

Two distinct sections make up the Asbestos and Enforcement Branch. Asbestos ensures any demolitions and asbestos-related renovations occur in accordance with Arkansas's asbestos regulation. Enforcement implements and enforces all State and federal air pollution regulatory requirements.

Permits Branch

The Permits Branch implements a single-permit system for new and modified facilities that encompasses both State and federal regulatory requirements for stationary sources. Permits include information on what pollutants are being released, how much may be emitted, and what steps the source's owner or operator is taking to reduce pollution. All permits include a mechanism to demonstrate compliance with the permit conditions. The permitting process ensures that stationary sources will be constructed or modified to operate without resulting in a violation of the Arkansas environmental statutes and regulations and without interfering with the attainment and maintenance of the national ambient air quality standards (NAAQS). Visit our website more information about OAQ's Permits Branch:
www.adeq.state.ar.us/air/permits/



Permitted Stationary Sources in Arkansas

Image Credit: Dwight Burdette

TYPES OF AIR PERMITS

▲ MAJOR SOURCE/TITLE V

For stationary sources of air pollutants that have actual or potential emissions at or above 100 tons per year of any criteria pollutant, ten tons per year for a single hazardous air pollutant (HAP) or twenty-five tons per year for any combination of HAPs, and for select categories of facilities regardless of emission rates

▲ MINOR SOURCE

Stationary sources required to obtain a permit under Arkansas Pollution Control and Ecology Commission (APC&EC) regulations, but do not meet any major source thresholds

▲ GENERAL PERMITS

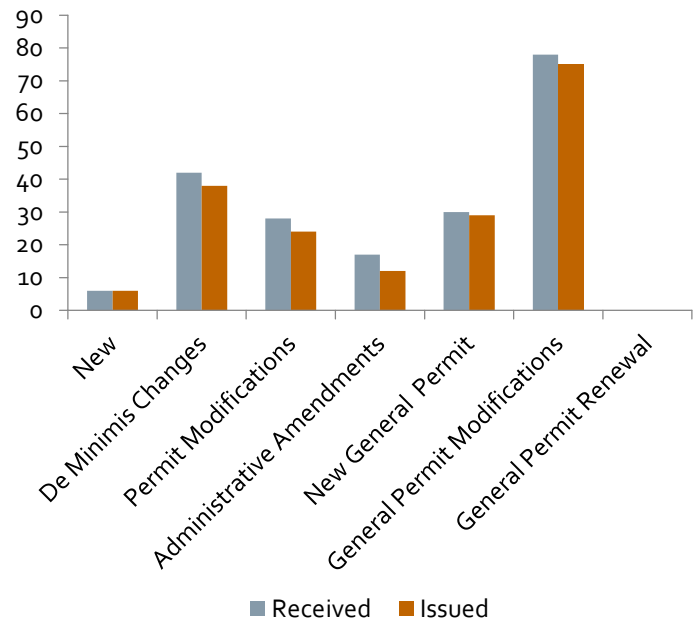
Standardized permits for air curtain incinerators, animal/human remains incinerator facilities, cotton gins, gasoline bulk plants, hot mix asphalt facilities, natural gas compression stations, and rock crushing facilities

Minor Source Permitting Metrics

During federal fiscal year (FFY) 2019, the Permits Branch received 201 minor source permit applications and issued 184 minor source permits.[1] The average processing time for new and modified minor source permits was 163 days.

Figure 1 (right) shows the breakdown in permit activity type of minor source permit applications received and issued.

Figure 1 Number of FFY 2019 Minor Source Permitting Activities

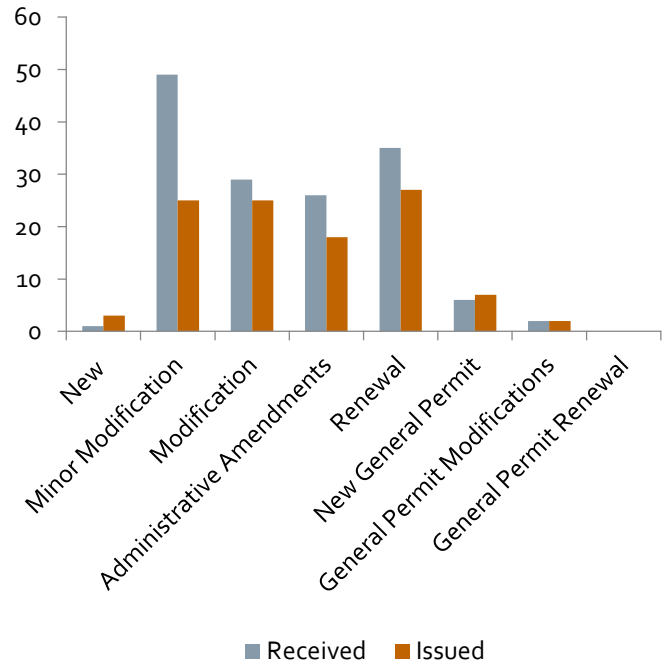


Title V Source Permitting Metrics

During FFY 2019, the Permits Branch received 148 Title V permit applications and issued 107 Title V permits/amendments. The average processing time for a new, renewed, or modified Title V permit was 229 days.

Figure 2 (right) shows the breakdown in permit activity type of Title V permit applications received and issued.

Figure 2 Number of FFY 2019 Title V Permitting Activities



[1] Federal fiscal year 2019 denotes the U.S. government's budgetary timeframe, October 1, 2018-September 30, 2019.

Title V National Rankings

DEQ is among the top state regulatory agencies in the nation for timeliness of Title V permit significant modification and renewal issuance.

Delays in issuance may result from late or incomplete applications or other factors that delay the permitting authority's ability to finalize action. The OAQ has engaged in a number of efforts in the past few years to streamline the permitting process to ensure timely issuance of permits.

TITLE V ISSUANCE TIMELINESS

▲ TITLE V RENEWALS

The Clean Air Act considers Title V renewals to be timely if they occur prior to the expiration of the existing permit. Permits that have not been renewed by the expiration date are referred to as "outstanding renewal permits."

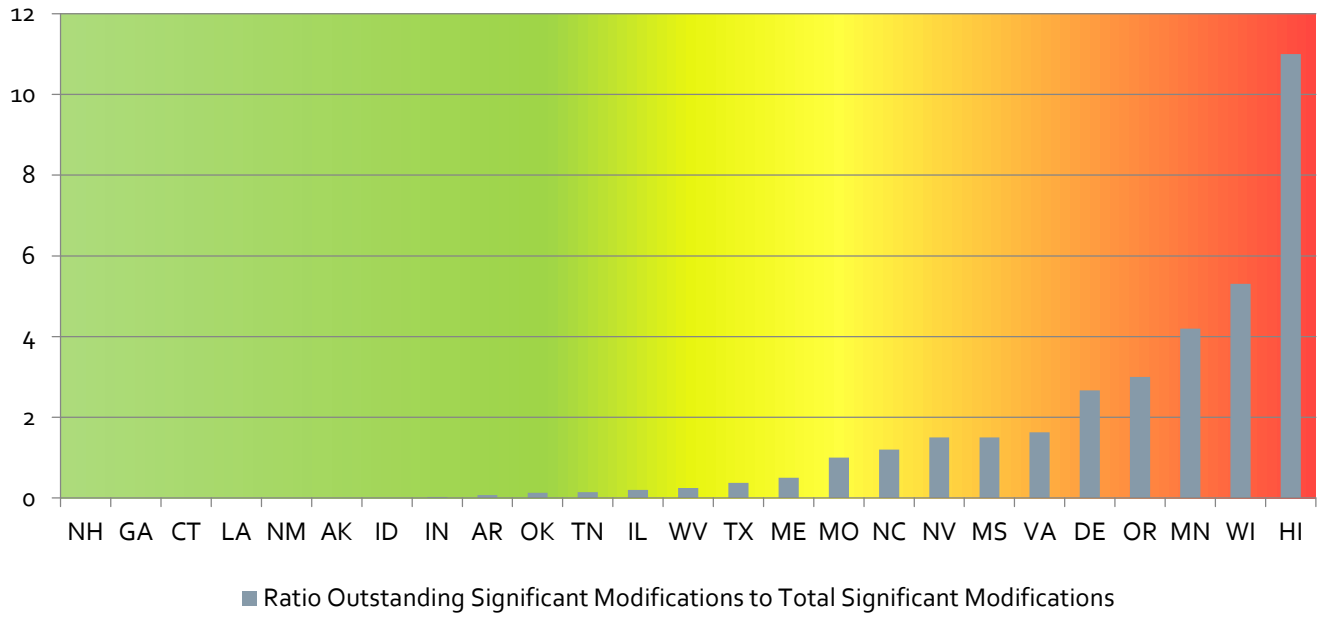
▲ SIGNIFICANT MODIFICATIONS

The Clean Air Act considers Title V significant modifications to be timely if they are issued within eighteen months of application submittal.

Title V Significant Modifications Rankings

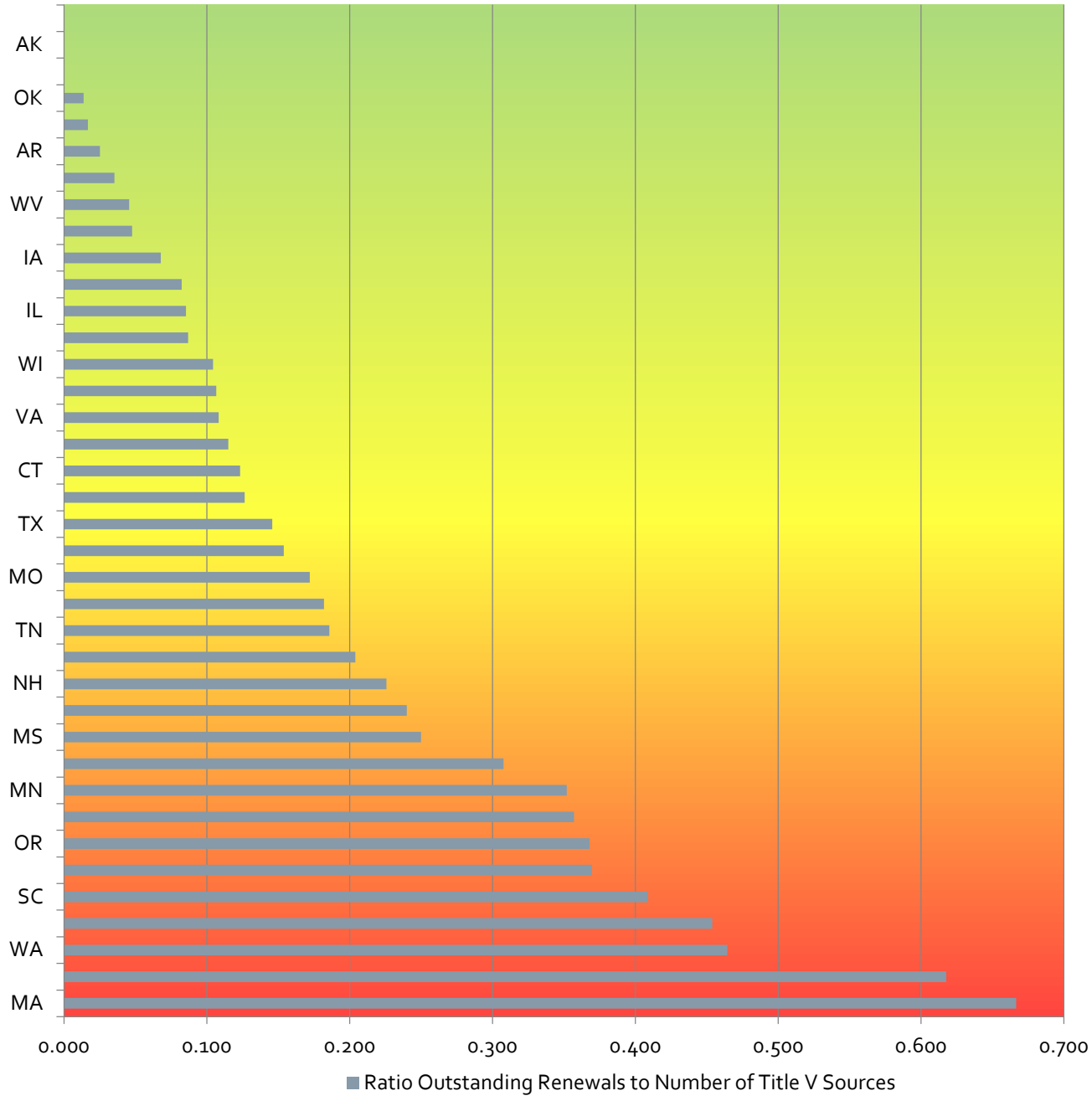
According to data from the EPA National Title V Database (January–June 2019), Arkansas is among the top state agencies for timeliness of Title V significant modification issuance. All but one of Arkansas's Title V significant modification actions for that period were completed within eighteen months.

Figure 3 Comparison of State Air Permitting Authority Timeliness for Issuance of Title V Significant Modifications

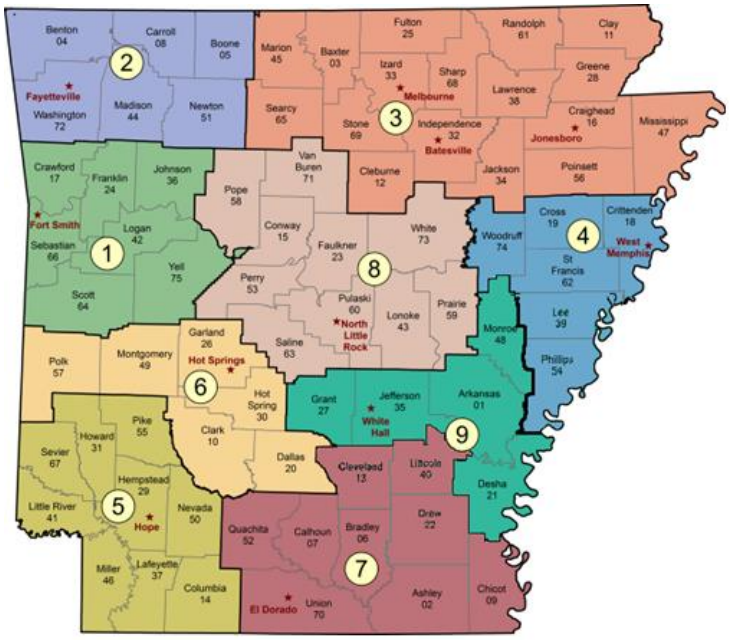


According to data from EPA's National Title V Database (January–June 2019), Arkansas is among the top ten state agencies for processing time of Title V renewals. Figure 4 illustrates Arkansas's ranking for Title V renewal timeliness in comparison with other states.

Figure 4 Comparison of State Air Permitting Authority Timeliness for Issuance of Title V Renewals



Compliance Branch



The Compliance Branch inspects permitted facilities to document whether owners and operators are complying with State and federal air pollution regulations, as specified in each facility's permit. This is accomplished through unannounced compliance inspections, stack testing, and monitoring and reporting requirements.

The Compliance Branch inspectors also investigate citizen complaints regarding air pollution, respond to emergency situations, and perform pre-assessments of sites for open burning of vegetative storm debris.

Arkansas has seventy-five counties, which are divided into nine inspection districts. The compliance districts are shown in the map above and contacts for each district are given in the sidebar to the right. Visit our website for more information about OAQ's Compliance Branch:

www.adeq.state.ar.us/air/compliance

INSPECTOR DISTRICT CONTACTS

▲ DISTRICT 1
Stephen Foster 479-424-0333
David Miesner 479-424-0333

▲ DISTRICT 2
Jay Ellis 479-267-0811 ext. 11

▲ DISTRICT 3
Keith Collins 870-793-4762
Coy Dobson 870-935-7221 ext. 11
Mitchel Kennedy 870-793-4762
Bryant Lamb 870-368-5053

▲ DISTRICT 4
James Starling 870-733-3526

▲ DISTRICT 5
Alex Mathis 870-777-7585

▲ DISTRICT 6
Risa Parker 501-520-5762

▲ DISTRICT 7
Jay Northern 870-862-5941
Tiffany Wooten 870-862-5941

▲ DISTRICT 8
Lori Burke 501-682-0737
Caleb Fielder 501-682-0775
Mikayla Shaddon 501-682-0808
Curtis Stehle 501-683-0962

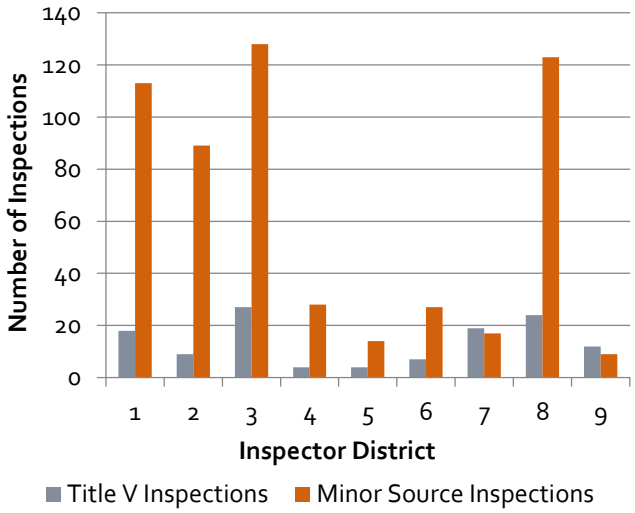
▲ DISTRICT 9
Gary Bortz 501-682-0706

Inspections

During FFY 2019, OAQ compliance branch air inspectors performed 548 inspections of minor sources and 124 inspections of Title V sources.

Inspectors also performed 629 stack test observations and reviewed 243 annual compliance certifications and 486 semi-annual monitoring reports.

Figure 5 FFY 2019 Air Compliance Inspections per District



Air Pollution Complaints

DEQ provides citizens with multiple ways to file air pollution complaints, including through the DEQ website (www.adeq.state.ar.us/complaints/forms/air_complaint.aspx) and via mobile applications.

Download on the App Store

ANDROID APP ON Google play

During FFY 2019, compliance air inspectors investigated 389 complaints.

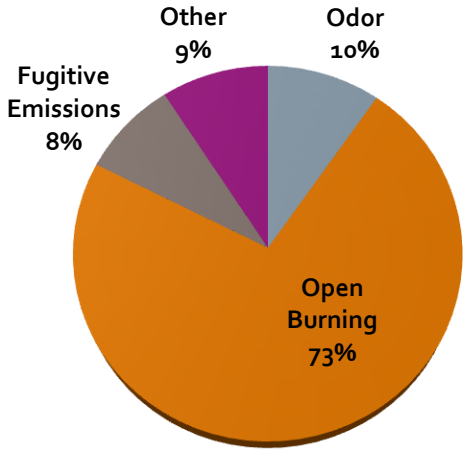
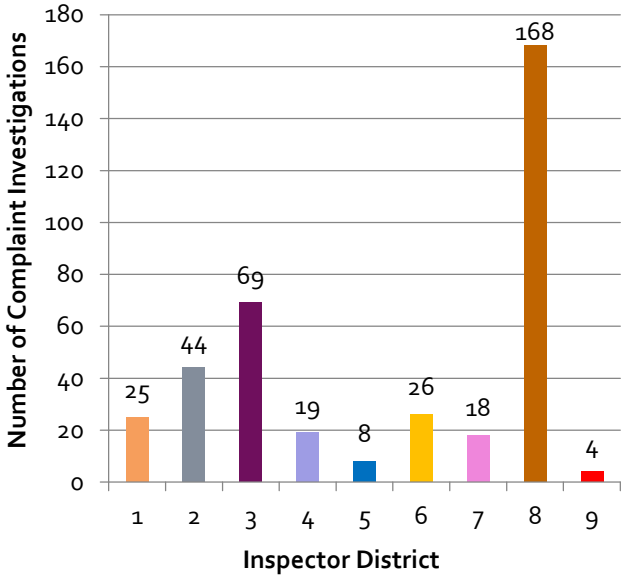
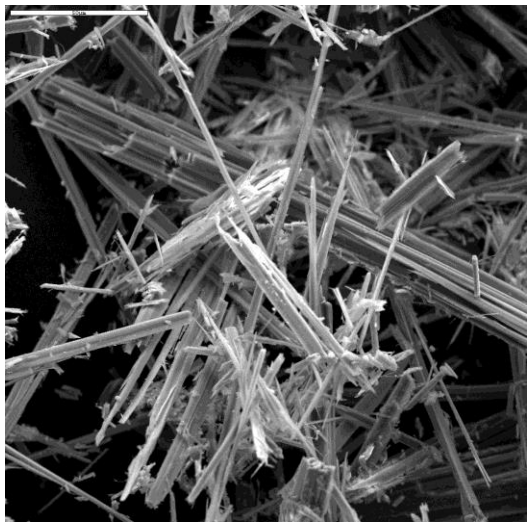


Figure 6 FFY 2019 Complaint Investigations Per District



Asbestos Program

DEQ's Asbestos Program ensures compliance with State and federal asbestos rules through complaint investigations, monitoring of demolition and renovation projects, licensing and certifying of asbestos professionals, and conducting outreach demonstrations. Arkansas asbestos regulations are contained in Regulation No. 21. Asbestos is also regulated as a hazardous air pollutant by the EPA.



Magnified Photo of Asbestos Fibers

The Asbestos Program also administers the Arkansas Asbestos Abatement Grant Program, which assists small cities and counties to clean up and stabilize structurally-impaired buildings containing friable asbestos. Visit DEQ's website for more information about OAQ's Asbestos Program:

www.adeq.state.ar.us/air/program

What is Asbestos?

Asbestos is a naturally occurring mineral substance, which over thousands of years has proven to be very useful and durable. Because of its resistance to heat, asbestos has been used in commercial applications such as cigarette filters, car brakes, building materials (insulation, flooring, roofing, piping, etc), fire-proof clothing, and stage curtains. While it seemed to be an all-purpose material, asbestos also proved to be detrimental to human health by causing diseases such as lung cancer, asbestosis, and mesothelioma. In 1971, the EPA deemed asbestos to be a hazardous air pollutant. In 1993, the APC&EC developed Regulation No. 21, which sets forth regulations pertaining to the handling of asbestos.

Although asbestos is no longer mined in the United States, it still has a variety of uses that are now regulated to ensure public safety. Through education, the public is learning to leave undamaged asbestos-containing material alone. It poses little harm when the fibers are not disturbed and broken into inhalable pieces that can ultimately attach to the pulmonary system and cause incurable illness.

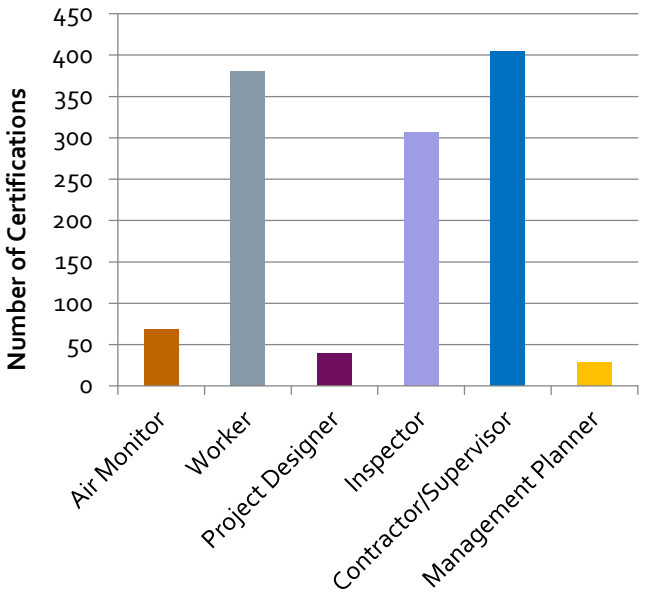
Complaints

During FFY 2019, Asbestos inspectors investigated fifty-two complaints.

Licenses and Certifications

During FFY 2019, DEQ issued 381 asbestos worker certifications, fifty-four contracting firm licenses, thirty-nine consulting firm licenses, and twenty training firm licenses. Figure 7 (top right) shows the certifications issued by type.

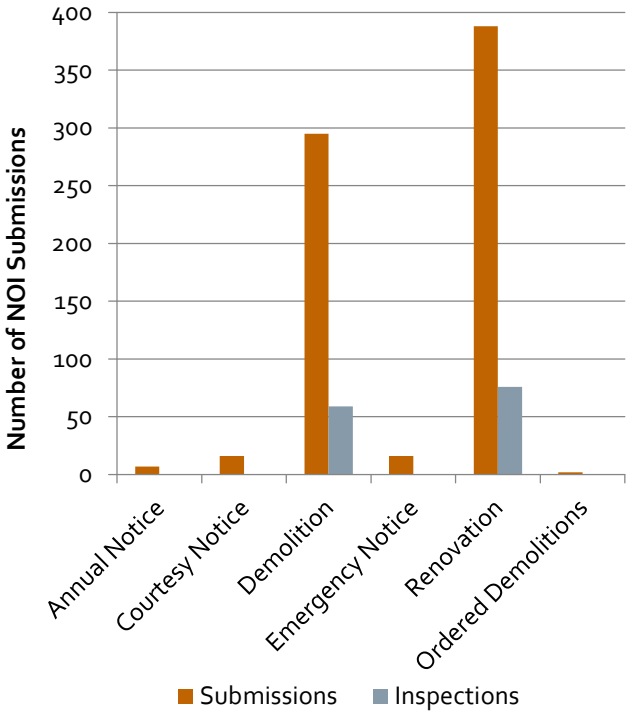
Figure 7 FFY 2019 Asbestos Worker Certifications by Type



Notice of Intent (NOI) Submissions and Inspections

During FFY 2019, DEQ received 683 NOIs for demolitions and renovations pursuant to Arkansas asbestos rules and performed 135 inspections pursuant to NOIs received. Figure 8 (bottom right) breaks down the type of NOI submissions received and inspections.

Figure 8 FFY 2019 Asbestos NOI Submissions by Type



Arkansas Asbestos Abatement Grant

The Arkansas Asbestos Grant Program is a competitive grants program to assist cities and counties with abatement, stabilization, and remediation in asbestos-related activities. In FFY 2019, DEQ awarded Dallas County $33,189 to clean up a condemned nursing facility. Visit our website for more information about the program:

www.adeq.state.ar.us/air/program/asbestos/grant

Enforcement

The Enforcement Section is responsible for administering consistent, appropriate, and timely enforcement of State and federal air pollution laws. This section provides support and assistance on OAQ enforcement issues designated for formal and informal enforcement action. These enforcement actions are taken in response to case referrals from the Asbestos Section, the Compliance Branch, and the Permit Branch. The enforcement process helps facilities successfully achieve compliance with State and federal standards and ensures compliance with air pollution laws and regulations. Visit our website more information about OAQ Enforcement: www.adeq.state.ar.us/air/program

TYPES OF ENFORCEMENT ACTIONS

▲ INFORMAL

Actions taken using a letter detailing violations that do not warrant a formal enforcement action, but require corrective action

▲ FORMAL

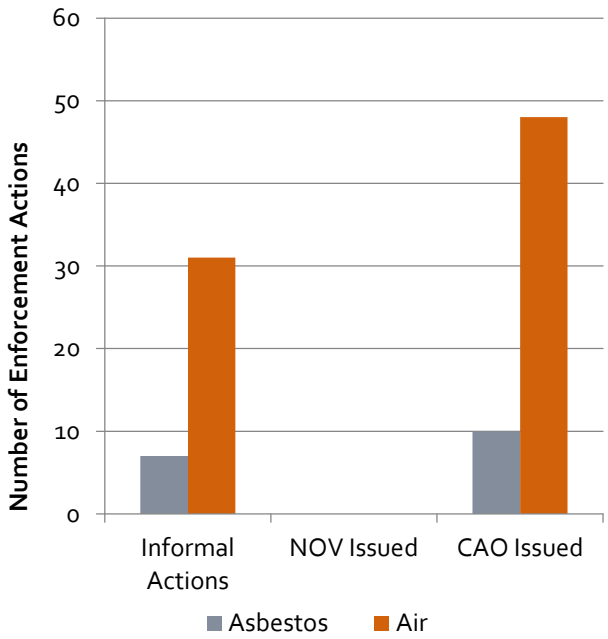
Actions taken using legally-binding consent administrative orders (CAOs) and/or notices of violation (NOVs) that incorporate civil penalties, corrective actions, and other terms

Enforcement Metrics

During FFY 2019, ninety-six cases were referred to the Enforcement Section. Thirty-eight cases were handled informally. Fifty-eight CAOs were issued to resolve formal enforcement actions. No NOVs were issued during this time period.

Figure 9 (right) breaks down the types of enforcement actions by media included in OAQ during FFY 2019.

Figure 9 FFY 2019 Enforcement Actions Completed



Policy and Planning Branch

Among other duties, the Policy and Planning Branch is responsible for gathering information on current and projected emissions trends, analyzing air quality data, and developing state plans to help maintain clean air in Arkansas. The Branch also provides technical expertise to the other branches of the OAQ and helps to educate the public about air quality issues.

Visit our website more information about OAQ's Planning Branch:
www.adeq.state.ar.us/air/planning

CORE RESPONSIBILITIES

- **EMISSIONS INVENTORY**
- **AIR QUALITY MODELING**
- **AIR QUALITY FORECASTING**
- **AIR QUALITY MONITORING**
- **STATE PLAN DEVELOPMENT**
- **REGULATORY INITITATIVES**
- **VOLUNTARY EFFORTS**

Emissions Inventory

During 2019, the Emissions Inventory team collected and verified submissions of industry emissions data from Type A sources. These emissions data must be submitted to EPA for inclusion in the national emissions inventory (NEI).

Sixty-six Type A sources submitted emissions reports for 2018 in 2019.

No Type B sources submitted emissions reports in 2019. These reports were last filed in 2018 and are not due again until 2021.

Trends in pollutant emissions reported to the NEI are included in Appendix C. Appendix C also presents trends in carbon dioxide (CO_2) emissions tracked by the United States Energy Information Administration.

EMISSIONS REPORTING

TYPE A SOURCE

Permitted to emit ≥ 2500 tons per year of sulfur oxides (SOx), nitrogen oxides (NOx), or carbon monoxide (CO); or

Permitted to emit ≥ 250 tons of volatile organic compounds (VOCs), coarse particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), or ammonia (NH_3).

Report emissions every year

TYPE B SOURCE

Permitted to emit ≥ 1000 tons per year of CO;

Permitted to emit ≥ 100 tons per year of SOx, NOx, VOC, PM_{10}, $PM_{2.5}$, or NH_3; or

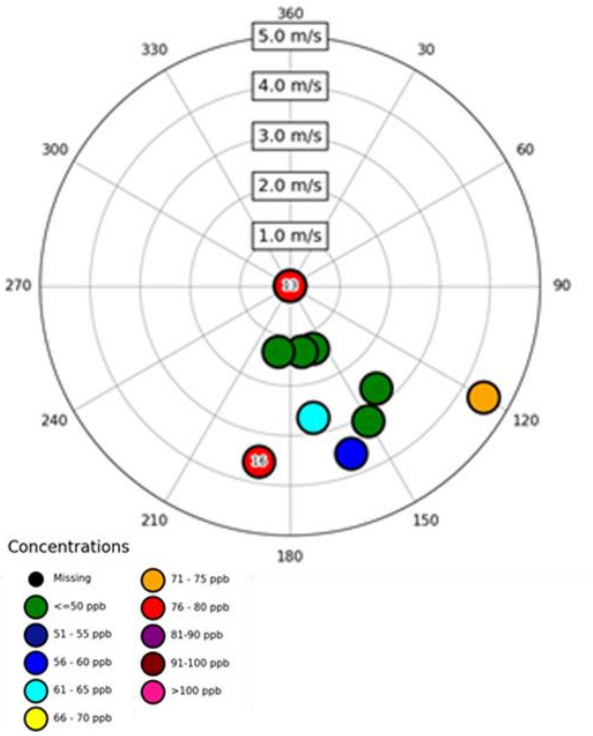
Have actual lead emissions ≥ 0.5 tons per year.

Report emissions every three years

Air Quality Modeling Achievements

In 2019, OAQ engaged in various modeling efforts. For example, OAQ performed four CALPUFF modeling runs to support analyses for a Prevention of Significant Deterioration permit application. Using the EPA's MOVES model, OAQ quantified the ozone precursor pollutants being emitted by on-road mobile sources in Crittenden County, AR. OAQ used python programming to develop sixteen hodogram analyses to simultaneously visualize wind vectors and affected pollutant concentrations within a single plot. OAQ also completed 715 runs of HYSPLIT modeling in support of an ozone transport plan.

OAQ acquired specialized computers for conducting mesoscale weather research and forecasting (WRF) evaluations and CAMx atmospheric chemistry modeling simulations. This technology will allow OAQ staff to investigate pollutant origins and simulate changes in atmospheric pollutant concentrations.



Hodogram Analysis

Air Quality Forecasting

Policy and Planning Branch technical staff produce air quality forecasts for northwest and central Arkansas. Forecasts are created by using meteorological data and pollutant concentration data to estimate ozone and fine particulate matter. These estimates are then translated into an Air Quality Index (AQI). The AQI is color-coded to indicate the level of health concerns for the forecasted pollutant concentrations.

AQI Value	Level of Health Concern	Colors
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Ambient air quality monitoring data show that the entire state of Arkansas is in attainment with all NAAQS.

Figure 10 below compares statewide average air quality conditions to the NAAQS. More information about Arkansas's Ambient Air Monitoring Network and trends in criteria pollutant monitoring data and visibility trends are included in Appendix B. OAQ also deploys special purpose air quality monitors from time to time to evaluate specific air quality concerns raised by citizens.

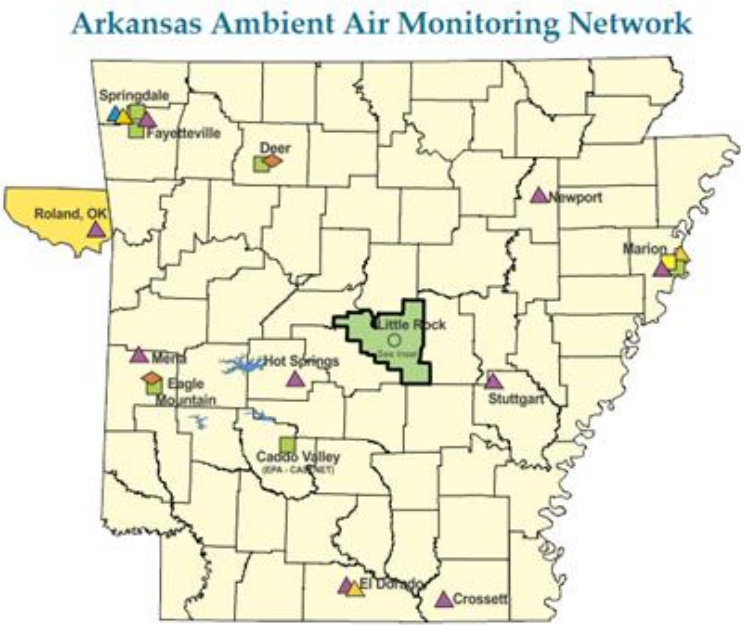
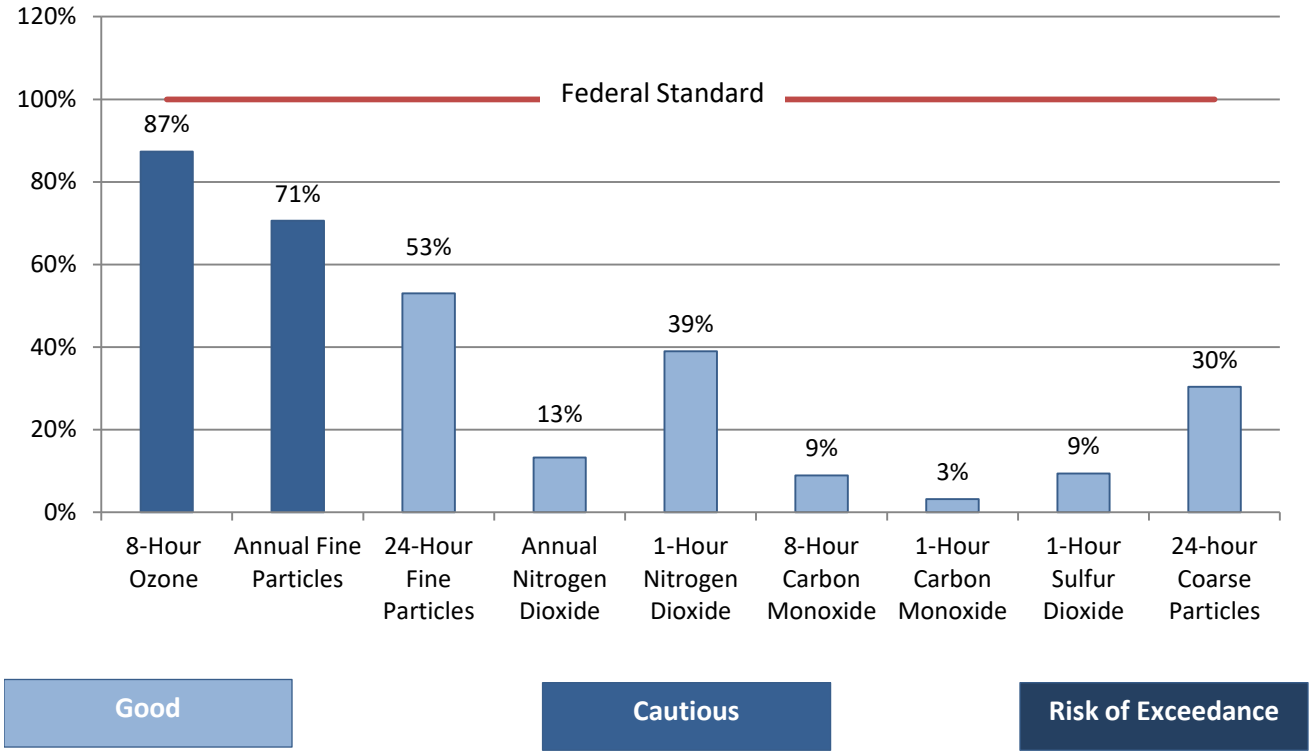


Figure 10 2018 Arkansas Statewide Average Air Quality Compared to the NAAQS



The Arkansas state implementation plan (SIP) demonstrates how the State will implement Clean Air Act requirements under State statutes and rules. The SIP covers multiple program areas including implementation of the NAAQS, addressing interstate pollution transport obligations, and ensuring protection of visibility in designated Class I wilderness areas and national parks.

OAQ staff frequently revises the SIP to comply with new federal regulations and changes to Arkansas law. All SIPs are made available for public comment prior to finalization. EPA reviews plan submissions and approves or disapproves each plan in whole or in part. In FFY 2019, OAQ worked on several SIP revisions, as detailed in the sidebar to the right.

In FFY 2019, OAQ also worked closely with EPA to resolve issues related to air plans while ensuring the State complies with the NAAQS. This was part of a nationwide effort to reduce the backlog of previous SIP submissions to EPA. Through this collaboration, the backlog for the State's previous SIP submissions was completely eliminated. Arkansas was the first state in EPA's Region 6 to clear the SIP backlog, and one of only three states nationwide.

Visit our website for more information on SIP actions in the state:
www.adeq.state.ar.us/air/planning/sip/

FY 2019 SIP ACTIONS

▲ PHASE III REGIONAL HAZE

-Addresses Regional Haze requirements for Domtar Ashdown Mill

-Submitted to EPA August 2019

▲ PERMIT FLEXIBILITY

-Addresses program permit flexibility provisions

-EPA final approval August 2019

▲ PHASE II REGIONAL HAZE

-Addresses SO_2 and PM control requirements for electric generating units

-EPA final approval and withdrawal of FIP September 2019

▲ 2015 OZONE INFRASTRUCTURE SIP

-Addresses Clean Air Act programmatic requirements for the 2015 ozone NAAQS

- Submitted to EPA in October 2019

▲ 2015 OZONE TRANSPORT SIP

-Addresses Clean Air Act "good neighbor" requirements for the 2015 ozone NAAQS

-Proposed in April 2019 and submitted to EPA in October 2019

▲ REGIONAL HAZE FIVE-YEAR PROGRESS REPORT

-Addresses Clean Air Act "good neighbor" requirements for the 2015 ozone NAAQS

-EPA final approval October 2019

Beginning in December 2018, OAQ's Planning Branch and Permitting Branch initiated the Efficiency and Streamlining Effort (EASE) to engage stakeholders in focused workgroups to discuss and to make recommendations for revisions to the rules and permitting procedures that will benefit industry, the agency's staff, and the public.

The primary goals for the consensus-driven effort are to:

- Remove or update outdated provisions including references to programs that no longer exist, provisions that are no longer applicable, facility names that have changed, and vacated and/or stayed provisions,
- Resolve inconsistencies between Regulations 18, 19, 26, and 31 and State statutes, other APC&EC rules, and federal rules, and
- Increase efficiency in future permitting and regulatory revision actions.

Suggestions by the group included structuring all rules consistently, removing arbitrary dates and expired or outdated provisions, and creating an online permitting guide hyperlinked to examples to assist applicants. OAQ's Policy and Planning Branch began preparing drafts of APC&EC air quality Rules 18, 19, 26, and 33 to incorporate the suggestions made by the EASE Collaborative. OAQ will continue work with EASE members into FFY 2020 on these and other identified streamlining priorities.

2019 STATE LEGISLATION

Laws passed by the State Legislature in 2019 require revisions to the State's pollution control regulations:

▲ ACT 315 OF 2019

-Eliminated references to "regulations" to provide for consistent references to "rules" throughout Arkansas Code

▲ TRANSFORMATION AND EFFICIENCIES ACT OF 2019

-Reduced the number of cabinet-level agencies from 42 to 15

-Restructured the Arkansas Department of Environmental Quality as a Division of Environmental Quality under the new Department of Energy and Environment

▲ ACT 820 OF 2019

-Required state agency licensing bodies to provide automatic or expedited-by-rule process for returning military veterans and their spouses

-Affects Arkansas Asbestos Abatement Regulation 21 and DEQ certification and licensing of asbestos abatement professionals

Volkswagen Environmental Mitigation Trust

As a result of two partial consent decrees in a case filed against the Volkswagen corporation for alleged violations of the federal Clean Air Act, Arkansas has been allocated $14,647,709 to award to projects that reduce emissions from motor vehicles.

On June 3, 2019, DEQ submitted an amended Beneficiary Mitigation Plan to the Trustee; this Plan amendment supersedes the June 2018 submission.

Funds awarded as a result of the Volkswagen Settlement are being used to reduce NOx emissions in Arkansas.

In FFY 2019, DEQ began accepting applications for two new programs funded by the settlement with Volkswagen. The Clean Fuels and State Agency Fleet Emissions Reductions (SAFER) programs will mitigate emissions from aging diesel engines through vehicle replacement and by repowering vehicles with cleaner-fuel engines. Volkswagen settlement dollars were also used to fund additional projects for DEQ's GoRED! program. Additional programs will be under development during FFY 2020.

Visit our website for more information about the program:
www.adeq.state.ar.us/air/planning/vw.aspx

DEQ PLANNED PROGRAMS UNDER BENEFICIARY MITIGATION PLAN

- **ADVANCED BUS AND CLEAN TRANSPORTATION PILOT**
  Pilot to replace aging diesel school and transit buses with new alternative-fueled buses
- **CLEAN FUELS**
  Competitive funding assistance program to repower or replace aging diesel Class 4–8 freight and drayage trucks and buses with new alternative-fueled engines or vehicles
- **ELECTRIC VEHICLE INFRASTRUCTURE**
  Rebate program for installations of level 2 and DC Fast electric vehicle chargers
- **STATE AGENCY FLEET EMISSION REDUCTIONS (SAFER)**
  Funding assistance for State agencies to repower or replace aging diesel Class 4 – 8 freight and drayage trucks
- **GO RED!**
  Volkswagen funds will be used to supplement DEQ's existing Go RED! program

Go RED!

The Go RED! program is a competitive funding assistance program that awards funding for projects that reduce emissions from diesel engines in Arkansas. The program is largely funded by the EPA's State Clean Diesel Grant Program, under the federal Diesel Emissions Reduction Act.

Public, private, and nonprofit entities in Arkansas are eligible to receive funding assistance for the installation of exhaust controls, engine upgrades, idle reduction technologies, engine replacements, and vehicle/equipment replacements.

In FFY 2019, DEQ awarded funding to ten recipients to replace a total of sixteen school buses, as detailed in Table 1 (right).

Table 1 FFY 2019 Go RED! Funding Assistance Recipients

RECIPIENT	PROJECT TYPE	AMOUNT
Barton-Lexa	Replaced two school buses	$42,431
Clinton	Replaced two school buses	$41,485
County Line	Replaced one school bus	$22,646
Hackett	Replaced one school bus	$21,869
Horatio	Replaced one school bus	$23,337
Dover	Replaced two school buses	$46,472
Mayflower	Replaced one school bus	$18,742
Jasper	Replaced three school buses	$50,000
Bentonville	Replaced two school buses	$50,000
Heber Springs	Replaced one school bus	$19,601
	TOTAL	**$336,583**

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We welcome your comments on the information contained in this report.

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Appendix A: National Ambient Air Quality Standards

Introduction

Setting the Standards

The Clean Air Act requires that the United States Environmental Protection Agency (EPA) set national ambient air quality standards (NAAQS) for pollutants that are common to outdoor air and are considered harmful to public health and the environment. These pollutants, which are referred to as "criteria pollutants," include ozone, particulate matter, carbon monoxide (CO), lead, sulfur dioxide (SO_2), and nitrogen dioxide (NO_2).

The EPA Administrator, in consultation with the Clean Air Scientific Advisory Committee, sets primary and secondary NAAQS for each criteria pollutant. The primary NAAQS is set at a level that reduces the risk of harm so as to protect public health, including sensitive populations, with an adequate margin of safety. The secondary NAAQS is set at a level that is protective of the public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

Periodic Review

The NAAQS are reviewed every five years to determine whether recent scientific data continue to indicate that the level, form, and averaging time of the current NAAQS are protective of public health. If the data show that the current level of the NAAQS is not protective of public health with an adequate margin of safety, then the EPA must revise the standard.

CRITERIA POLLUTANTS

- **CARBON MONOXIDE (CO)**
- **LEAD**
- **NITROGEN DIOXIDE (NO_2)**
- **OZONE**
- **FINE PARTICULATES ($PM_{2.5}$)**
- **COARSE PARTICULATES (PM_{10})**
- **SULFUR DIOXIDE (SO_2)**

FEDERAL STATUTORY REQUIREMENTS

- **CLEAN AIR ACT § 108**
  Air Quality and Control Techniques
- **CLEAN AIR ACT § 109**
  National Primary and Secondary Ambient Air Quality Standards
- **CLEAN AIR ACT §110**
  State Implementation Plans for National Ambient Air Quality Standards
- **CLEAN AIR ACT §111**
  Standards of Performance for New Stationary Sources
- **CLEAN AIR ACT §§ 160-169B**
  Prevention of Significant Deterioration
- **CLEAN AIR ACT §§ 171-193**
  Plans for Nonattainment Areas

Implementation

States must develop implementation plans to ensure that all areas of the state attain and maintain any new or revised NAAQS. Areas in which the NAAQS for a particular criteria pollutant is not being met are designated as nonattainment and require additional planning efforts to improve air quality. The Governor makes nonattainment designation recommendations and the EPA promulgates them. EPA classifies nonattainment areas as marginal, moderate, serious, severe, or extreme, based on the severity of the air pollution and the availability and feasibility of pollution control measures. For each nonattainment area, the affected states must develop plans to reduce pollutant levels in the air to achieve attainment with the NAAQS as expeditiously as possible.

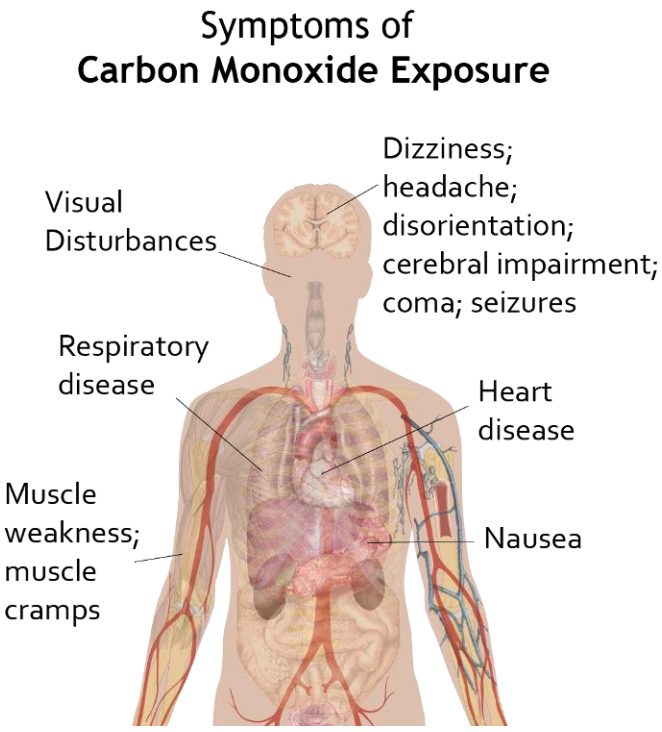
Table A-1 List of Current National Ambient Air Quality Standards

POLLUTANT	PRIMARY/ SECONDARY	AVERAGING TIME	LEVEL	FORM
Carbon Monoxide (CO)	Primary	8-hour	9 parts per million	Not to be exceeded more than once per year
		1-hour	35 parts per million	
Lead	Primary and Secondary	Rolling 3-month average	0.15 micrograms per cubic meter	Not to be exceeded
Nitrogen Dioxide (NO_2)	Primary	1-hour	100 parts per billion	98th percentile, averaged over 3 years
	Primary and Secondary	Annual	53 parts per billion	Annual mean
Ozone	Primary and Secondary	8-hour	70 parts per billion	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Fine Particulate Matter ($PM_{2.5}$)	Primary	Annual	12 micrograms per cubic meter	Annual mean, averaged over 3 years
	Secondary	Annual	15 micrograms per cubic meter	
	Primary and Secondary	24-hour	350 micrograms per cubic meter	98th percentile, averaged over 3 years
Coarse Particulate Matter (PM_{10})	Primary and Secondary	24-hour	150 micrograms per cubic meter	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)	Primary	1-hour	75 parts per billion	99th percentile of 1-hour daily maximum concentration, averaged over 3 years
	Secondary	3-hour	0.5 parts per million	Not to be exceeded more than once per year

CO can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and other tissues. At extremely high levels, CO can cause death.

People with several types of heart disease already have a reduced capacity for pumping oxygenated blood to the heart, which can cause them to experience myocardial ischemia (reduced oxygen to the heart), often accompanied by chest pain (angina), when exercising or under increased stress. For these people, short-term CO exposure further exacerbates their body's already compromised ability to respond to the increased oxygen demands of exercise or exertion. The primary NAAQS is set to reduce the acute risks of exposure to carbon monoxide

CO is a colorless, odorless gas emitted from combustion processes. CO is primarily a byproduct of incomplete combustion of fuels such as gasoline, natural gas, oil, coal, and wood. CO emissions in Arkansas come primarily from fires, mobile sources, and biogenic sources.[2] Smaller contributions come from industrial processes, fuel combustion, solvents, and other miscellaneous sources.



SOURCES OF EMISSIONS

- **VEHICLES**
- **FIRE**
- **POWER PLANTS**
- **INDUSTRY**
- **FOSSIL FUEL COMBUSTION**

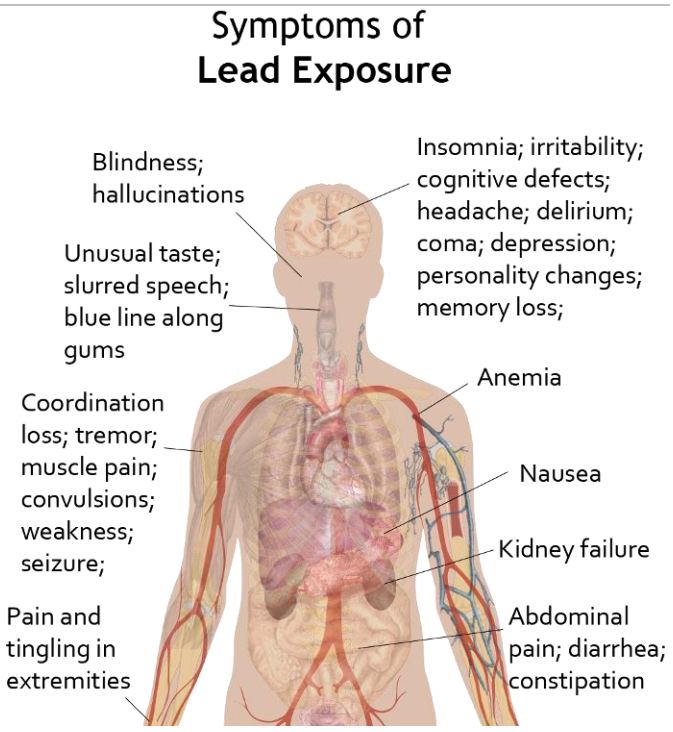
[2] Source: 2014 National Emissions Inventory version 2 https://gispub.epa.gov/neireport/2014/

Lead

Exposures to lead over a long period of time can cause deleterious effects on the central nervous system. Lead exposure is particularly harmful to children because exposure may lead to neurodevelopmental impairment resulting in lowered intelligence quotients (IQ) and behavioral problems. According to the Centers for Disease Control, harmful effects may also result from short-term exposures to very high levels of lead. The NAAQS is set at this level to reduce the risk of long-term health effects due to lead exposure.

Lead is a naturally occurring element that can be found in the air, water, and soil. Although small levels of lead are naturally occurring in soil, lead is also emitted into the air during ore and metals processing and combustion of fuels containing lead.

In Arkansas, fifty-eight percent of lead emissions are from aircraft running on leaded fuel. The remaining forty-two percent is from electricity generation and other industrial processes.[3] Lead emitted into the air can settle onto surfaces like soil, dust and water where it can remain for long periods because it does not decay or decompose.



SOURCES OF EMISSIONS

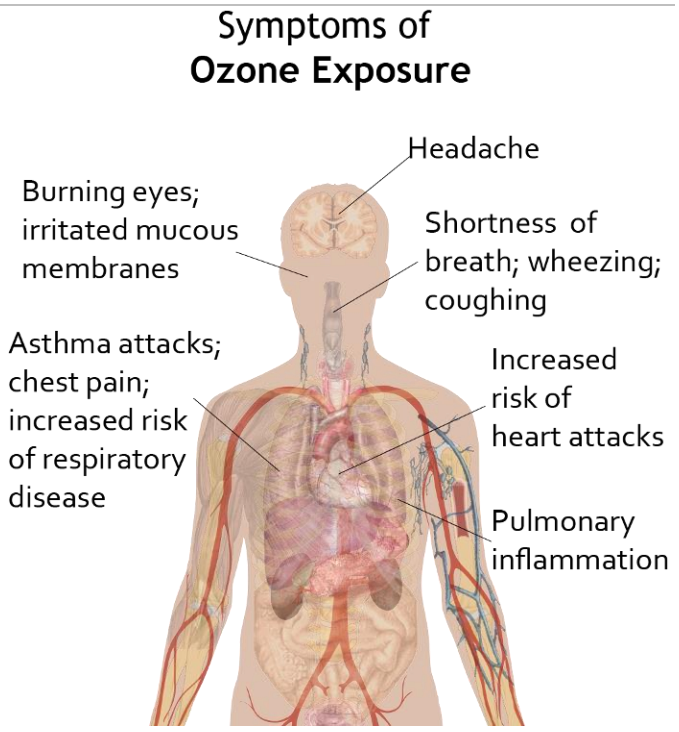
- AIRPORTS
- VEHICLES BURNING LEADED FUELS
- ORE AND METALS PROCESSING
- WASTE INCINERATORS
- POWER PLANTS
- LEAD-ACID BATTERY MANUFACTURERS
- LEAD SMELTERS

[3] Source: 2014 National Emissions Inventory version 2

At ground level, ozone is unhealthy to breathe and can trigger various respiratory and cardiovascular health problems. In setting the level of the ozone standard, EPA considers various clinical and epidemiological studies to evaluate what level, averaging time, and form of the standard would be protective of human health and public welfare. The primary NAAQS is set to reduce the risk of acute and chronic health effects due to ozone exposure.

Ozone is ubiquitous in the natural environment. Ozone is formed by photochemical reactions involving nitrogen oxides (NOx), volatile organic compounds (VOCs), and sunlight. The formation of ozone is highly weather dependent, and ozone can be transported long distances by wind.

VOCs can be emitted from both biogenic (naturally occurring in organisms) and anthropogenic (caused by people) sources. In Arkansas, approximately eighty-one percent of VOC emissions come from biogenic sources, particularly trees, and only ten percent of emissions come from sources regulated by State and federal air quality programs. NOx is formed primarily by the combustion of fossil fuels.



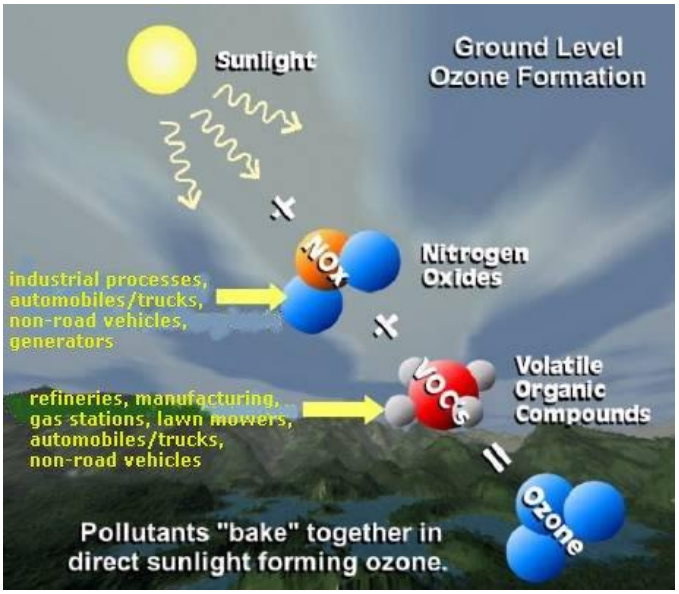


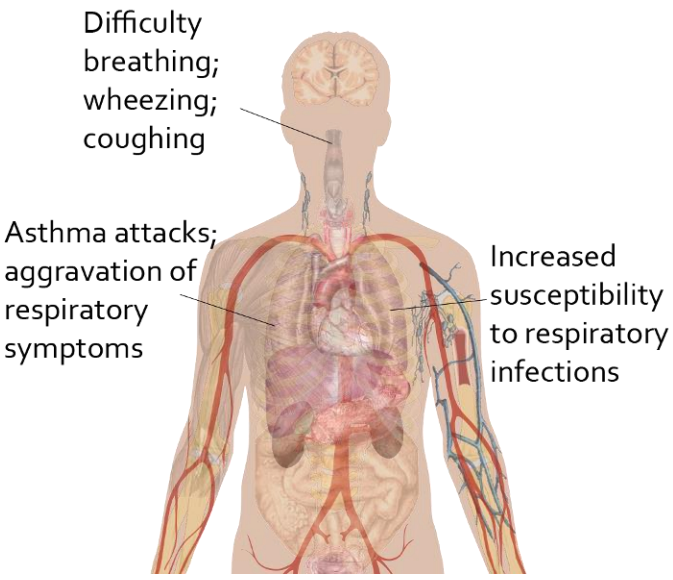
Image Credit: Harris County, Texas

Nitrogen Dioxide (NO_2)

NO_2 is one of a group of highly reactive gases known as "nitrogen oxides," or NOx. Other nitrogen oxides include nitrous acid and nitric acid. EPA's NAAQS uses NO_2 as the indicator for the larger group of NOx. Exposure to NOx occurs through inhalation. Scientific studies link short-term NOx exposures, ranging from thirty minutes to twenty-four hours, with adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma. Also, studies show a connection between breathing short-term elevated NOx concentrations and increased visits to emergency departments and hospital admissions for respiratory issues. This is especially true for people with asthma. The primary NAAQS is set to reduce the risk of acute and chronic health effects due to exposure to NOx.

NOx forms quickly from emissions from cars, trucks, buses, power plants, and off-road equipment. NOx may be transported for long distances and may react with other pollutants or water vapor to form secondary pollutants. NOx emissions in Arkansas result primarily from mobile sources and fuel combustion. Smaller sources include biogenic sources, industrial processes, fires, solvents and other miscellaneous sources.

Symptoms of
Nitrogen Dioxide Exposure



SOURCES OF EMISSIONS

- **VEHICLES**
- **POWER PLANTS**
- **OFF-ROAD EQUIPMENT**
- **INDUSTRY**
- **FIRES**
- **FOSSIL FUEL COMBUSTION**

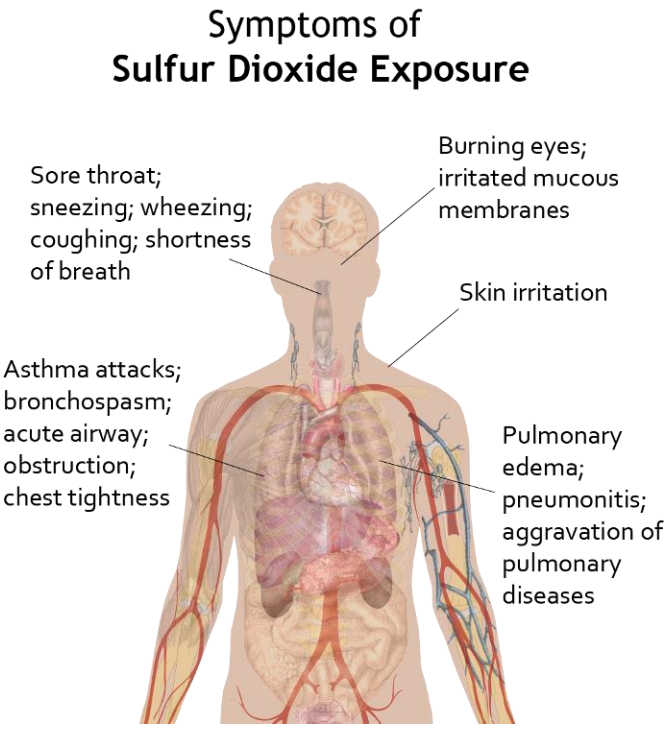
Sulfur Dioxide (SO_2)

SO_2 is one of a group of highly reactive gases known as "oxides of sulfur." Current scientific evidence links short-term exposures to SO_2, ranging from five minutes to twenty-four hours, with an array of adverse respiratory effects, including bronchoconstriction and increased asthma symptoms. These effects are particularly important for asthmatics at elevated ventilation rates (e.g., while exercising or playing). The primary NAAQS is set to reduce the risk of acute and chronic health effects due to exposure to SO_2

While SO_2 tends not to be transported long distances in its original form, it does react with other pollutants and water vapor to form fine particulates and acidic aerosols that may be transported long distances. It also contributes to acid rain.

The largest sources of SO_2 emissions are from fossil fuel combustion at power plants and other industrial facilities. Smaller sources of SO_2 emissions include industrial processes, such as extracting metal from ore, and the burning of high sulfur-containing fuels by locomotives, large ships, and nonroad equipment.

SO_2 emissions in Arkansas result primarily from fuel combustion, with much smaller contributions from fires, industrial processes, mobile sources, solvents and other miscellaneous sources.



SOURCES OF EMISSIONS

- **INDUSTRY**
- **POWER PLANTS**
- **VEHICLES AND HEAVY EQUIPMENT THAT BURN HIGH SULFUR CONTENT FUELS**
- **VOLCANOES**

Particulate Matter (PM_{10} and $PM_{2.5}$)

There are two size fractions of particulate matter for which EPA sets NAAQS: PM_{10} and $PM_{2.5}$. The primary NAAQS is set to reduce the risk of acute and chronic health effects due to exposure to particulate matter.

PM_{10} particles are small enough to enter the respiratory tract once inhaled. Inhalation of PM_{10} can increase the frequency and severity of asthma attacks, cause or aggravate bronchitis and other lung diseases, and reduce the body's ability to fight infections. Certain populations may be more sensitive to the effects of particulate pollution than others. These include children, the elderly, exercising adults, and those with pre-existing lung diseases.

$PM_{2.5}$ particles are microscopic solids and liquid droplets that are small enough to penetrate deep into the lungs when inhaled. Scientific studies have linked $PM_{2.5}$ exposure to a number of adverse health effects. These effects include the following: premature death in people with heart or lung disease; nonfatal heart attacks; irregular heartbeat; aggravated asthma; decreased lung function; and increased respiratory symptoms, such as irritation of airways, coughing, and difficulty breathing.

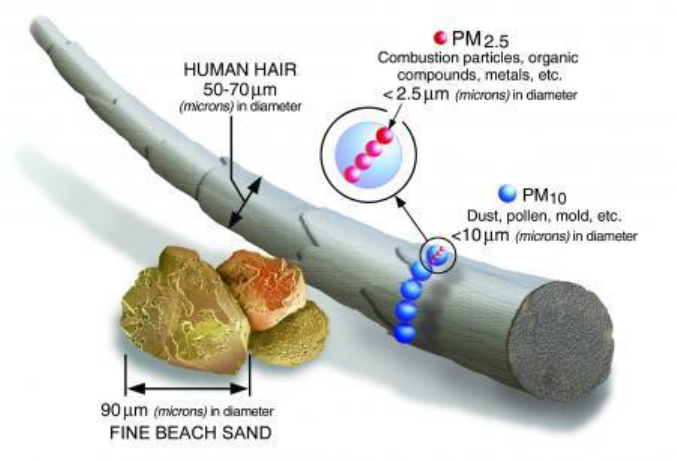


Image Credit:
United States Environmental Protection Agency

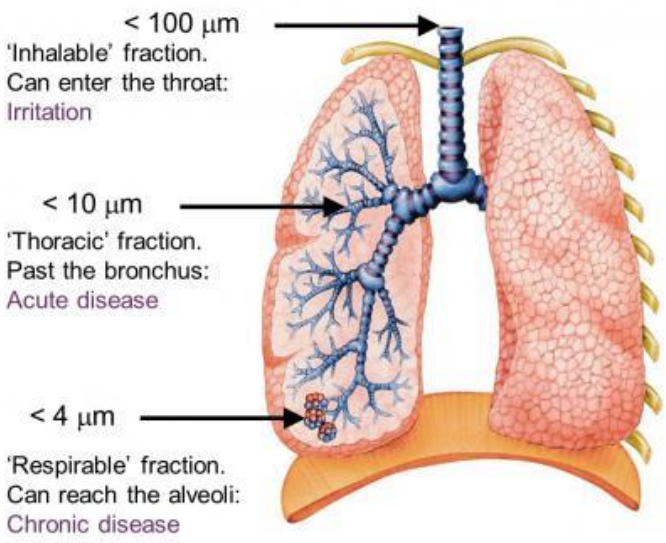


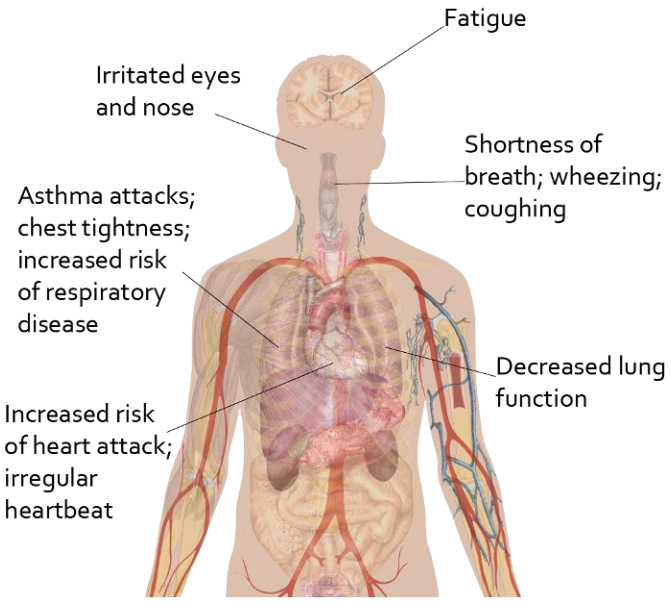
Image Credit: United States Geological Survey

PM_{10} and $PM_{2.5}$ fractions of particulate matter have different physical characteristics and are emitted by different sources. PM_{10} particles originate from a variety of mobile and stationary sources, and their chemical composition varies widely. Actions that generate PM_{10} particles include grinding or crushing operations, mineral processing, agricultural operations, fuel combustion, and fires. $PM_{2.5}$ is emitted directly from diesel engines, smelters, and other combustion sources. $PM_{2.5}$ can also form in the atmosphere due to complex reactions of precursor compounds, such as SO_2 and NOx. $PM_{2.5}$ may be composed of sulfate, nitrate, ammonium, and/or hydrogen ions. It may also contain elemental carbon, metal compounds, organic compounds, and particle-bound water.

PM_{10} particles often settle in areas relatively near their sources. However, smaller $PM_{2.5}$ particles may stay suspended in the atmosphere for long periods of time and may be transported hundreds of miles.

In Arkansas, the primary sources of PM_{10} and $PM_{2.5}$ are electricity generation via fossil fuel combustion and pulp and paper plants.

Symptoms of **Particulate Exposure**



SOURCES OF EMISSIONS

- **FIRE**
- **POWER PLANTS**
- **INDUSTRY**
- **VEHICLES**
- **AGRICULTURE**
- **DUST**

Appendix B: Arkansas Air Quality Monitoring

Introduction

DEQ has monitored air quality in the State of Arkansas for over thirty-five years. The Division's air monitoring network is composed of various types of intermittent and continuous monitors that are strategically located throughout the state. Using the high-quality information provided by the monitoring network, DEQ can confirm that air quality programs in the state are adequately protecting public health and that environmental goals are being achieved.

Arkansas's ambient air quality monitoring network is used to determine attainment with the national ambient air quality standards (NAAQS) for the following criteria pollutants: ozone, particulate matter ($PM_{2.5}$ and PM_{10}), carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2). Attainment is determined based on a comparison of time-weighted averages (design values) to the level of the NAAQS.

There are also two particulate matter speciation monitors in Arkansas that are part of the IMPROVE network, which tracks visibility conditions in Class I national parks and wilderness areas. In Arkansas, IMPROVE monitors are located in the Upper Buffalo Wilderness Area and the Caney Creek Wilderness Area.

Table B-1 Pollutants Monitored by Arkansas Ambient Air Quality Network

POLLUTANT	NUMBER OF MONITORS	LOCATIONS
Ozone	8	Clark County Crittenden County Newton County Polk County Pulaski County[4] Washington County[5]
PM10	3	Pulaski County Washington County
PM2.5	12	Arkansas County Ashley County Crittenden County Garland County Jackson County Polk County Pulaski County Union County Washington County
CO	1	Pulaski County
NO_2	2	Crittenden County Pulaski County
SO_2	1	Pulaski County

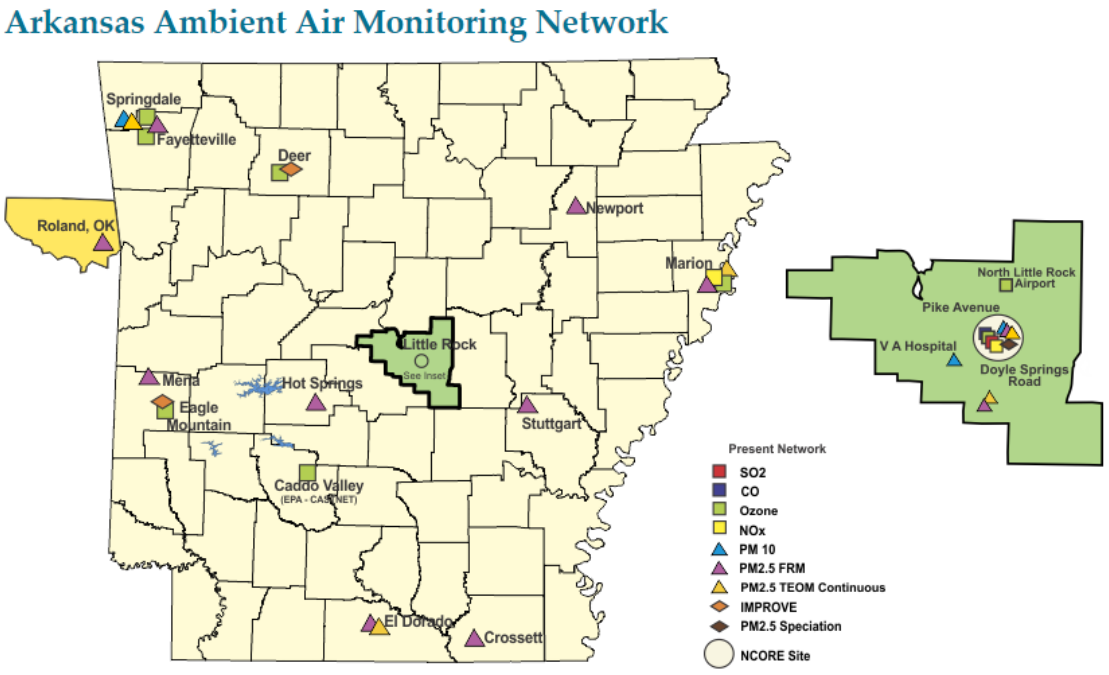
[4] Pulaski County contains two monitors for Ozone, three for PM2.5, and three for PM10.
[5] Washington County contains two monitors for Ozone.

Determining Locations for Ambient Air Monitors

Ambient air monitoring networks are established according to federal requirements based on total population in a metropolitan statistical area and the following factors:

1. Where the highest concentration is expected to occur in the area covered by the monitor (usually determined through modeling);
2. What the expected representative concentrations are in areas of high population density;
3. What impacts on ambient pollution levels significant sources or source categories may have; and
4. What the background concentration levels are.

Arkansas's Ambient Air Monitoring Network is pictured below.



Periodic Review of Monitoring Network

DEQ reviews the Arkansas Ambient Air Monitoring Network each year to detail the exact expected operation schedule for each monitor for the coming calendar year. The network is evaluated every five years to determine whether the current number and location of monitors meets DEQ's environmental monitoring objectives and satisfies federal monitoring requirements for each pollutant.

Carbon Monoxide (CO)

Monitor Network

Pollutant: Carbon Monoxide

Method: Instrumental/Non-Dispersive Infrared Photometry

Data Interval: Hourly

Units: Parts per million (ppm)

Arkansas is in attainment with the primary one-hour and primary eight-hour NAAQS for CO. This attainment status is based on results from the Arkansas CO ambient air monitoring network. No more than one observed ("Obs") average value can exceed the level of the standard for each CO NAAQS. Table B-2 provides a summary of CO monitor activity for 2018. Figures B-1 and B-2 illustrate trends relative to the corresponding NAAQS.

NAAQS DESIGN VALUE

- ONE-HOUR PRIMARY NAAQS

Thirty-five parts per million (35 ppm), not to be exceeded more than once per year

- EIGHT-HOUR PRIMARY NAAQS

Nine parts per million (9 ppm), not to be exceeded more than once per year

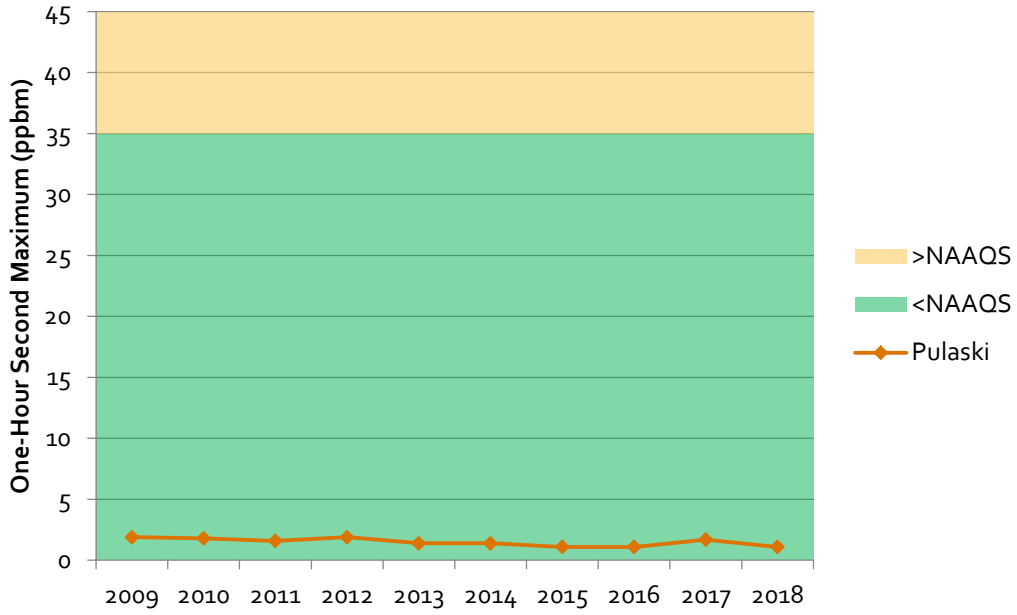
- THERE ARE NO SECONDARY CO NAAQS

Table B-2 2018 Arkansas CO Monitor Values Summary Data

COUNTY	SITE ADDRESS	#OBS	EIGHT-HOUR AVERAGES (ppm)			ONE-HOUR AVERAGES (ppm)		
			1st Max	2nd Max	Obs > 9	1st Max	2nd Max	Obs>35
Pulaski	Pike Ave at River Rd, North Little Rock	8707	.9	.8	0	1.2	1.1	0

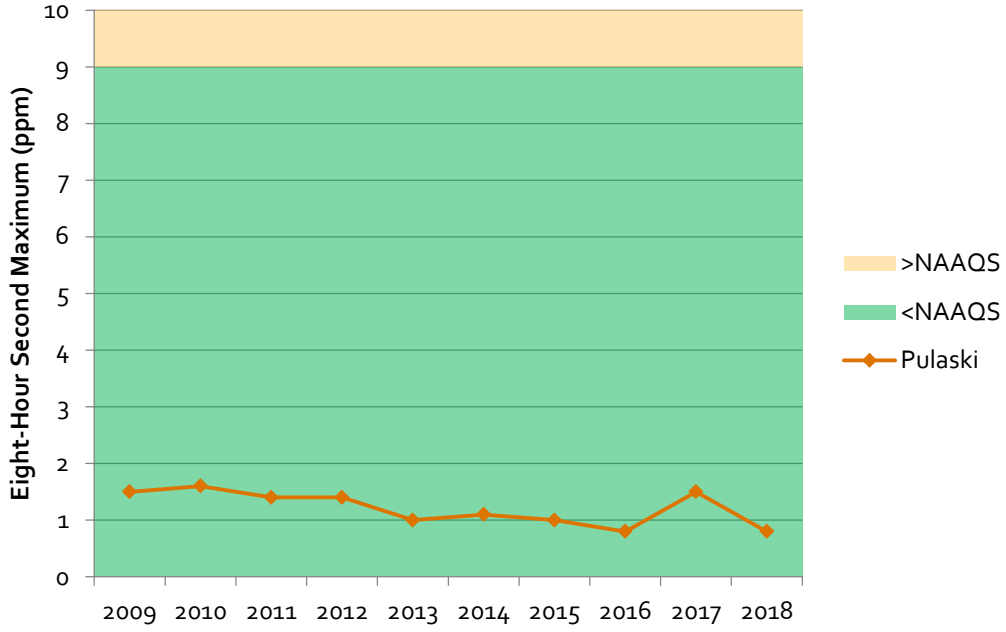
The values contained in the figures below are displayed to the right of the figure along with the slope and R^2 value. The closer the R^2 value is to one, the more confidence we have in the slope's indication of a positive or negative trend.

Figure B-1 Trends in Second Highest Observed One-Hour Average CO Concentration



	PULASKI
2009	1.9
2010	1.8
2011	1.6
2012	1.9
2013	1.4
2014	1.4
2015	1.1
2016	1.1
2017	1.7
2018	1.1
Slope	-0.0776
R^2	0.5172

Figure B-2 Trends in Second Highest Observed Eight-Hour Average CO Concentration



	PULASKI
2009	1.5
2010	1.6
2011	1.4
2012	1.4
2013	1
2014	1.1
2015	1
2016	0.8
2017	1.5
2018	.8
Slope	-0.0673
R^2	0.4504

Nitrogen Dioxide (NO_2)

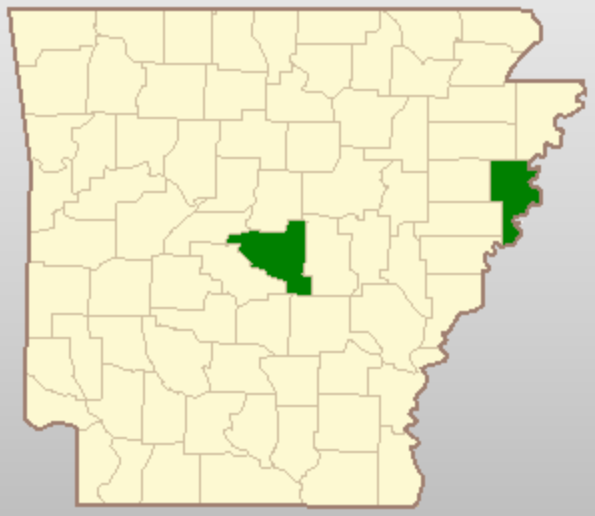
Monitor Network

Pollutant: Nitrogen Dioxide

Method: Instrumental/Gas-Phase Chemiluminescence

Data Interval: Hourly

Units: Parts per billion (ppb)



Arkansas is in attainment with all NO_2 NAAQS. This attainment status is based on results from the Arkansas NO_2 ambient air monitoring network. Table B-3 provides a summary of NO_2 monitor activity for 2018. Figures B-3 and B-4 illustrate trends over the past ten years in nitrogen dioxide design values relative to the corresponding NAAQS.

NAAQS DESIGN VALUE

▲ ONE-HOUR PRIMARY NAAQS

One-hundred parts per billion (100 ppb), ninety-eighth percentile of one-hour daily maximum concentrations averaged over three years

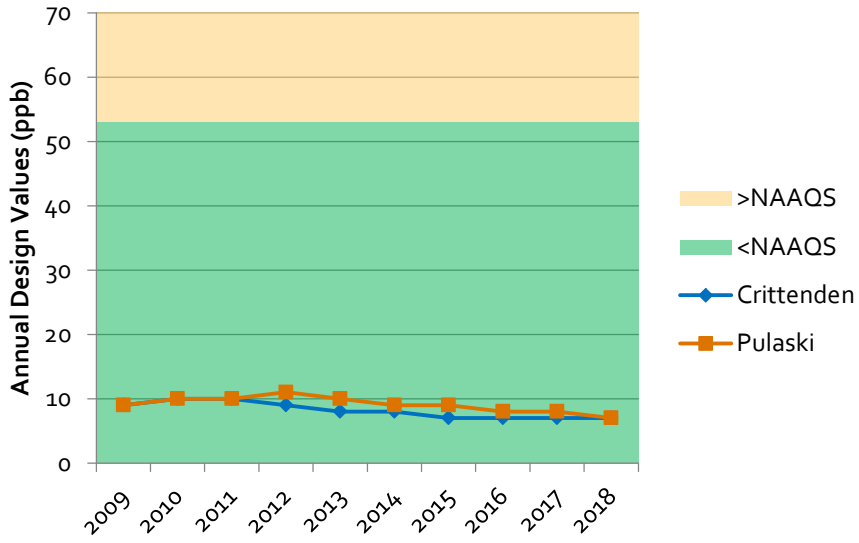
▲ ANNUAL PRIMARY AND SECONDARY NAAQS

Fifty-three parts per billion (53 ppb), annual mean

Table B-3 2018 Arkansas NO_2 Monitor Values Summary Data

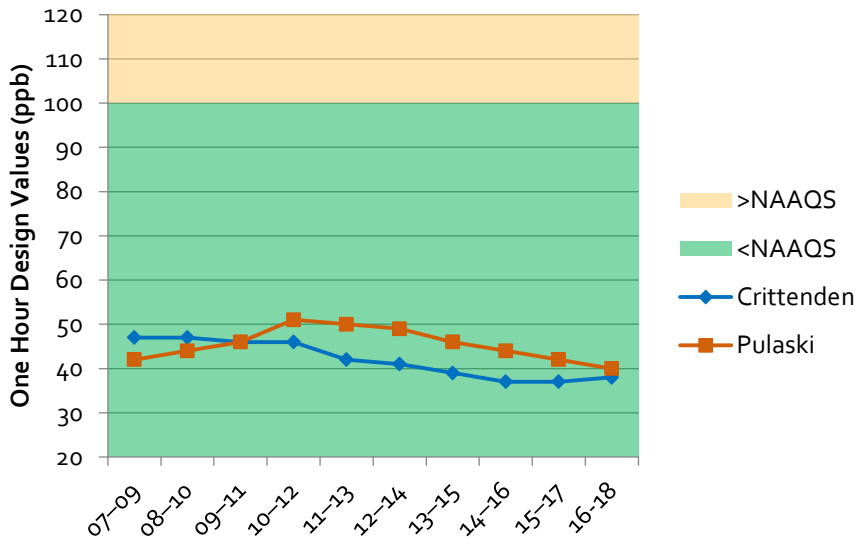
COUNTY	SITE ADDRESS	#OBS	98TH PERCENTILE ONE-HOUR AVERAGE (ppb)	ANNUAL MEAN (ppb)
Pulaski	Pike Ave at River Rd, North Little Rock	8703	42	7.31
Crittenden	LH Polk St and Colonial Dr, Marion	8719	38	7.09

Figure B-3 Trends in Annual-Hour Nitrogen Dioxide Design Values



	PULASKI	CRITTENDEN
2009	9	9
2010	10	10
2011	10	10
2012	11	9
2013	10	8
2014	9	8
2015	9	7
2016	8	7
2017	8	7
2018	7	7
Slope	-0.2970	-0.3636
R^2	0.0564	0.8021

Figure B-4 Trends in in One-Hour Nitrogen Dioxide Design Values



	PULASKI	CRITTENDEN
2009	42	47
2010	44	47
2011	46	46
2012	51	46
2013	50	42
2014	49	41
2015	46	39
2016	44	37
2017	42	37
2018	40	38
Slope	-0.0352	-1.3212
R^2	0.0833	0.9115

Ozone

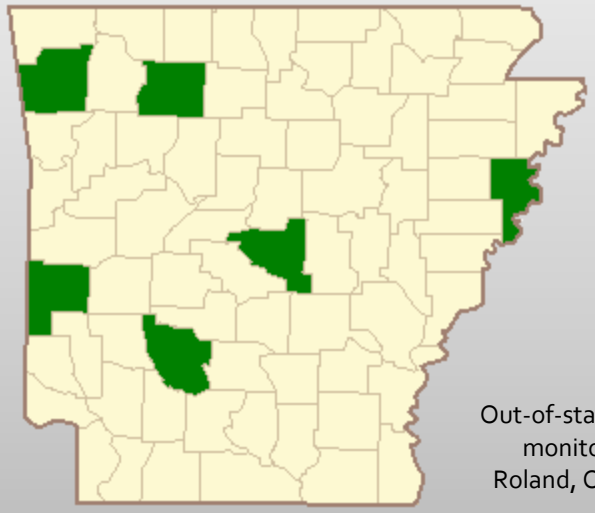
Monitor Network

Pollutant: Ozone

Method: Ultra-Violet Photometry

Data Interval: Hourly

Units: Parts per million (ppm)



Out-of-state monitor: Roland, OK

Arkansas is in attainment with the ozone NAAQS. This attainment status is based on data generated by the Arkansas ozone ambient air monitoring network. Table B-4 provides a summary of ozone monitor activity for 2018. Figure B-5 illustrates trends over the past ten years in ozone design values relative to the NAAQS in effect for that year.

NAAQS DESIGN VALUE

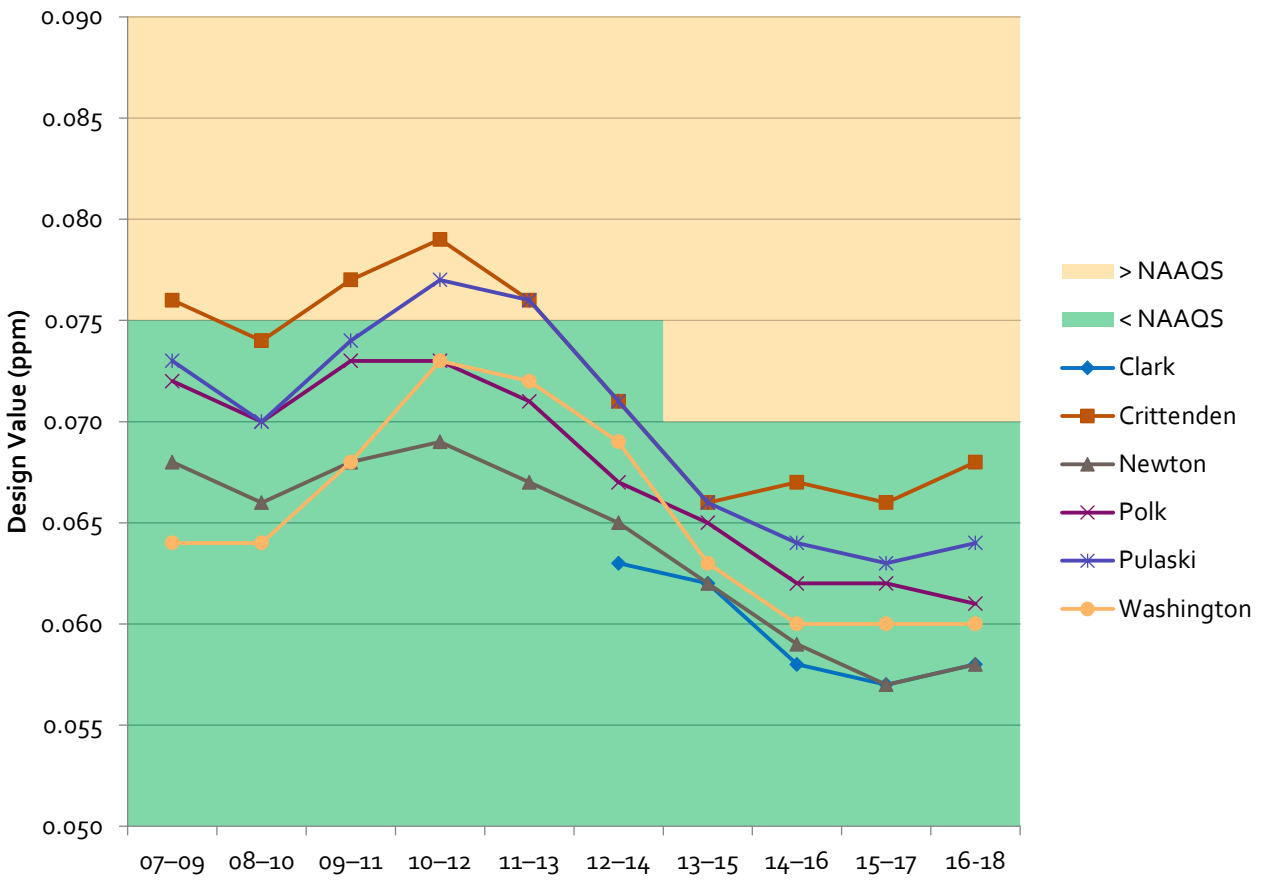
▲ EIGHT-HOUR PRIMARY AND SECONDARY NAAQS

Seventy parts per billion (70 ppb or 0.070 ppm), annual fourth-highest daily maximum eight-hour concentration averaged over three years

Table B-4 2018 Arkansas Ozone Monitor Values Summary Data

COUNTY	SITE ADDRESS	VALID DAYS	DAILY MAXIMUM EIGHT-HOUR AVERAGE (ppm)	
			4TH MAX	OBS > 0.070
Clark	Lower Lake Recreation Area, Caddo Valley	272	0.062	0
Crittenden	LH Polk St and Colonial Dr, Marion	275	0.07	3
Newton	AR Hwy 16	274	0.062	0
Polk	463 Polk 631, Mena	271	0.063	0
Pulaski	Pike Ave at River Rd, North Little Rock	362	0.064	2
Pulaski	Remount Rd, North Little Rock	275	0.067	0
Washington	600 South Old Missouri Rd, Springdale	275	0.064	0
Washington	429 Ernest Lancaster Dr, Fayetteville	274	0.065	0

Figure B-5 Trends in Eight-Hour Ozone Design Values



COUNTY	07-09	08-10	09-11	10-12	11-13	12-14	13-15	14-16	15-17	16-18	SLOPE	R^2
Clark					0.063	0.062	0.058	0.057	0.057	0.058	-0.0015	0.7705
Crittenden	0.074	0.077	0.079	0.076	0.071	0.066	0.067	0.066	0.066	0.068	-0.0013	0.6667
Newton	0.066	0.068	0.069	0.067	0.065	0.062	0.059	0.057	0.057	0.058	-0.0013	0.8004
Polk	0.07	0.073	0.073	0.071	0.067	0.065	0.062	0.062	0.062	0.061	-0.0014	0.8236
Pulaski	0.07	0.074	0.077	0.076	0.071	0.066	0.064	0.063	0.063	0.064	-0.0013	0.5816
Washington	0.064	0.068	0.073	0.072	0.069	0.063	0.06	0.06	0.06	0.06	-0.0008	0.2608

Sulfur Dioxide (SO_2)

Monitor Network

Pollutant: Sulfur Dioxide

Method: Instrumental Ultra-Violet Fluorescence

Data Interval: Hourly

Units: Parts per billion (ppb)

All areas of Arkansas are designated attainment, attainment/unclassifiable, or unclassifiable with all SO_2 NAAQS. There are no SO_2 nonattainment areas in Arkansas. Attainment status is based on results from the Arkansas SO_2 ambient air monitoring network described below and the SO_2 designations modeling. Table B-5 provides a summary of SO_2 monitor activity for 2018. Figure B-6 illustrates the trend over the past ten years in SO_2 design values relative to the primary NAAQS.

NAAQS DESIGN VALUE

▲ ONE-HOUR PRIMARY NAAQS

Seventy-five parts per billion (75 ppb), ninety-ninth percentile of one-hour daily maximum concentrations averaged over three years

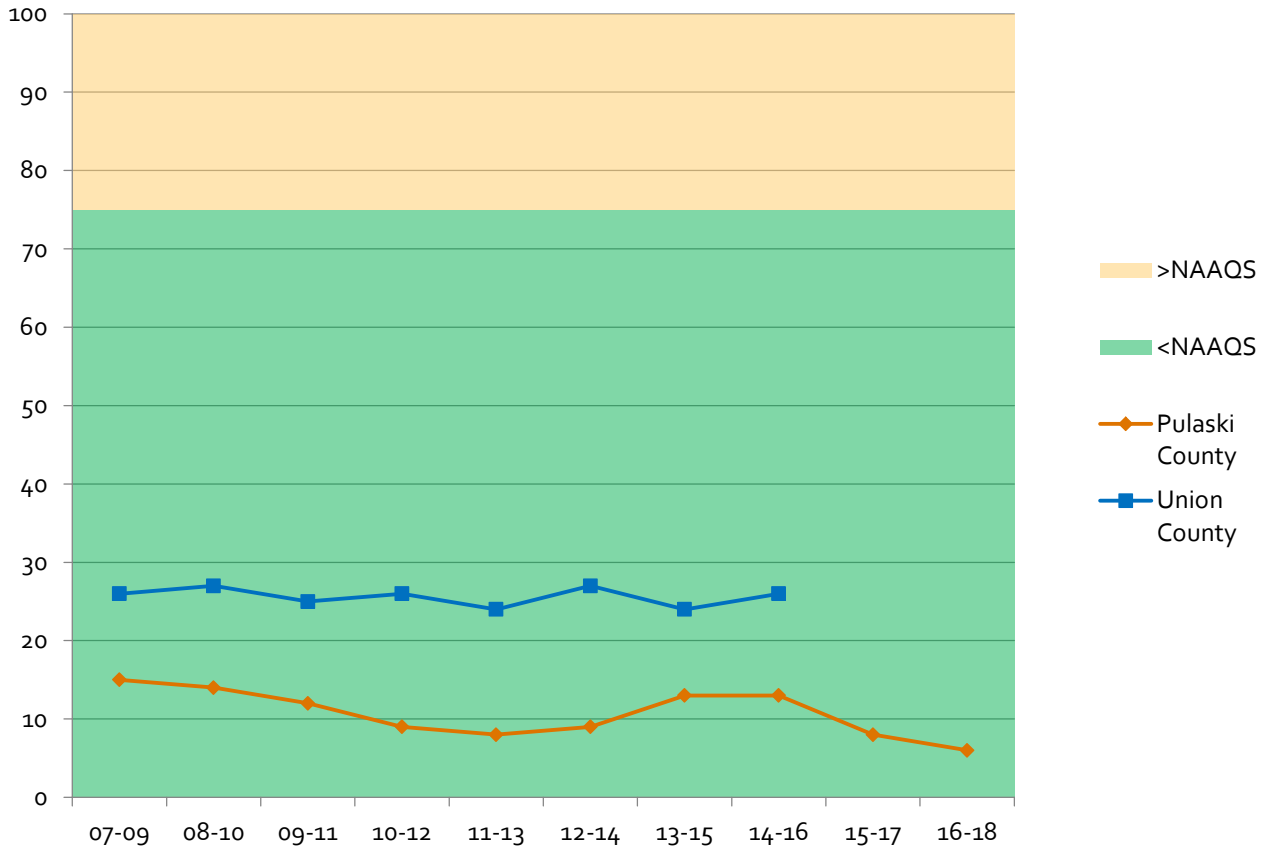
▲ THREE-HOUR SECONDARY NAAQS

One-half part per million (0.5 ppm or 500 ppb), not to be exceeded more than once per year

Table B-5 2018 Arkansas SO_2 Monitor Values Summary Data

COUNTY	SITE ADDRESS	ONE-HOUR	
		# obs	99th Percentile (ppb)
Pulaski	Pike Ave at River Rd, North Little Rock	8706	6

Figure B-6 Trends in One-Hour SO_2 Design Values[6]



COUNTY	07-09	08-10	09-11	10-12	11-13	12-14	13-15	14-16	15-17	16-18	SLOPE	R^2
Pulaski	15	14	12	9	8	9	13	13	8	6	-0.6364	0.3973
Union	26	27	25	26	24	27	24	26			-0.1310	0.0729

[6] The Union County SO2 monitor was removed December 31, 2016.

Coarse Particulate Matter (PM10)

Monitor Network

Pollutant: PM10

Method: Gravimetric

Data Interval: Twenty-Four Hour

Units: Micrograms per cubic meter ($\mu g/m^3$)

Arkansas is in attainment with the PM10 NAAQS. This attainment status is based on results from the Arkansas PM10 ambient air monitoring network. Table B-6 provides a summary of PM10 monitor activity for 2018. Figure B-7 illustrates trends over the past ten years in maximum PM10 twenty-four hour concentrations relative to the PM10 NAAQS.

NAAQS DESIGN VALUE

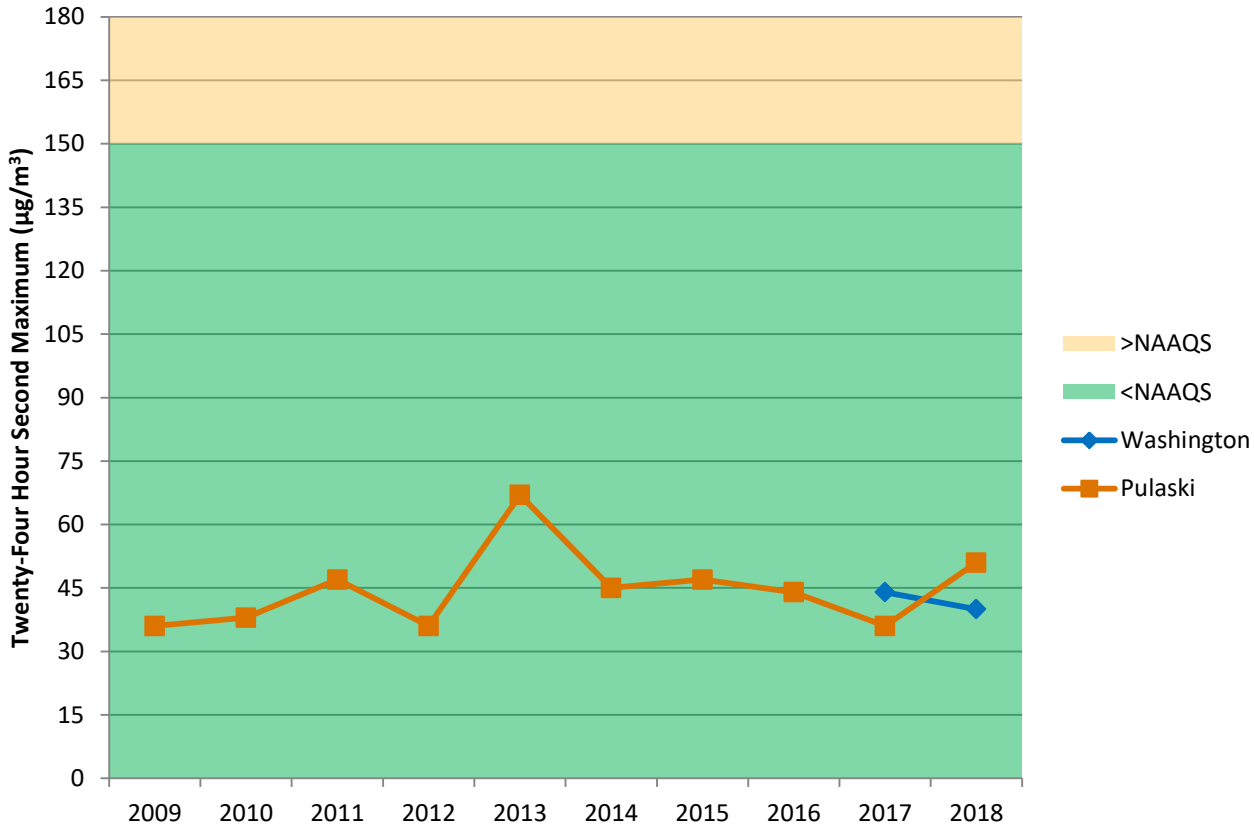
▲ TWENTY-FOUR HOUR PRIMARY AND SECONDARY NAAQS

One-hundred fifty micrograms per cubic meter (150 $\mu g/m^3$), not to be exceeded more than once per year on average over three years

Table B-6 2018 Arkansas PM10 Monitor Values Summary Data

COUNTY	SITE ADDRESS	VALID DAYS	DAILY MAXIMUM AVERAGE (µG/M3)	
			1ST MAX	2ND MAX
Pulaski	Pike Ave at River Rd, North Little Rock	61	65	51
Pulaski	Pike Ave at River Rd, North Little Rock	30	62	27
Pulaski	Remount Rd, North Little Rock	60	65	35
Washington	600 South Old Missouri Road	60	57	40

Figure B-7 Trends in Twenty-Four-Hour Maximum PM10 Concentrations[7]



COUNTY	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	SLOPE	R^2
Pulaski	36	38	47	36	67	45	47	44	36	51	0.7091	0.0506
Washington									44	40	NA*	NA*

[7] The monitor installed in Washington County was installed in 2017. Because there are not at least three data points, DEQ did not perform a trends analysis for this monitor.

Fine Particulate Matter (PM2.5)

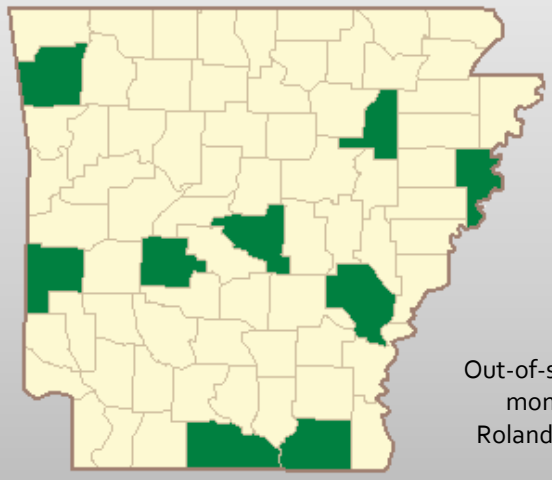
Monitor Network

Pollutant: PM2.5

Method: Gravimetric

Data Interval: Twenty-Four Hour

Units: Micrograms per cubic meter ($\mu g/m^3$)



Out-of-state monitor: Roland, OK

Arkansas is in attainment with all PM2.5 NAAQS. This attainment status is based on results from the Arkansas PM2.5 ambient air monitoring network. Table B-7 provides a summary of PM2.5 monitor activity for 2018. Figures B-8 and B-9 illustrate trends over the past ten years in PM2.5 design values relative to the corresponding, concurrent primary NAAQS.

NAAQS DESIGN VALUE

▲ ANNUAL PRIMARY AND NAAQS

Twelve micrograms per cubic meter (12 $\mu g/m^3$), annual mean averaged over three years

▲ ANNUAL SECONDARY NAAQS

Fifteen micrograms per cubic meter (15 $\mu g/m^3$), annual mean averaged over three years

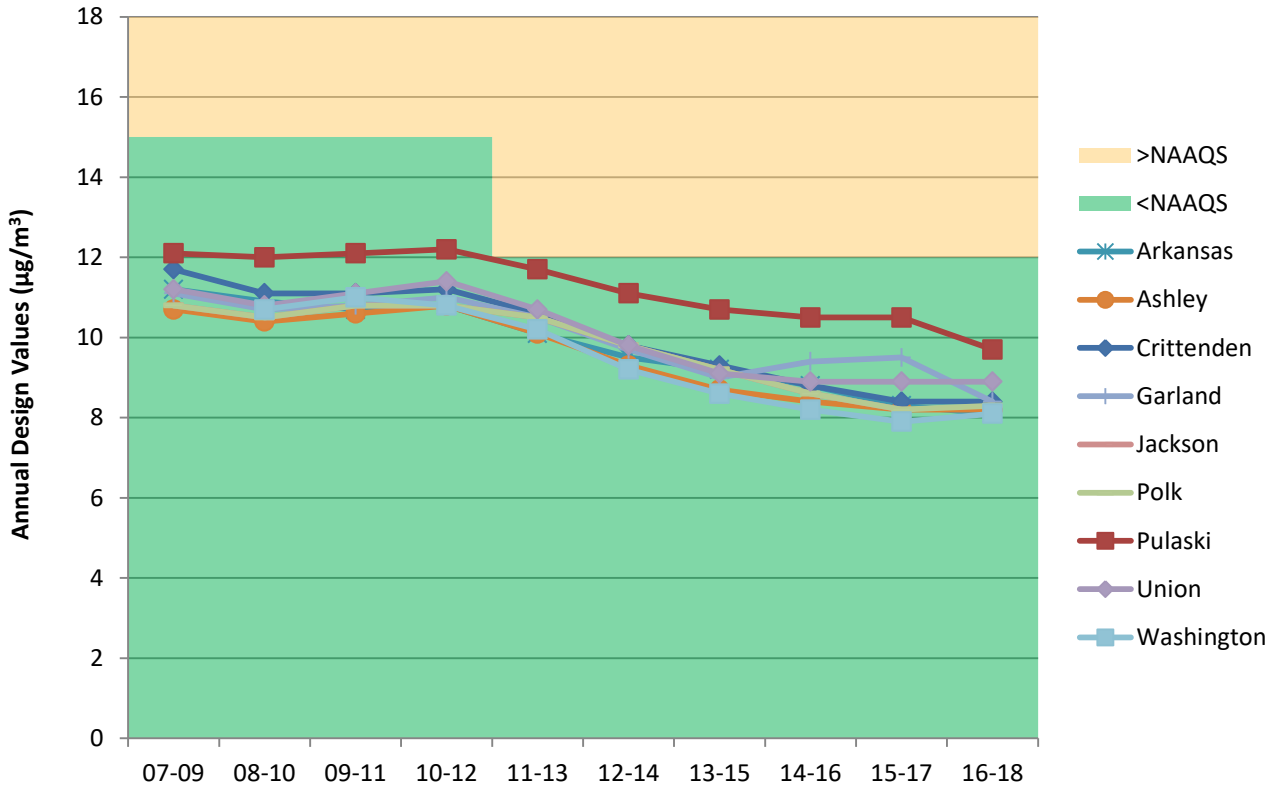
▲ TWENTY-FOUR HOUR PRIMARY AND SECONDARY NAAQS

Thirty-five micrograms per cubic meter (35 $\mu g/m^3$), ninety-eighth percentile, averaged over three years

Table B-7 2018 Arkansas PM2.5 Monitor Values Summary Data

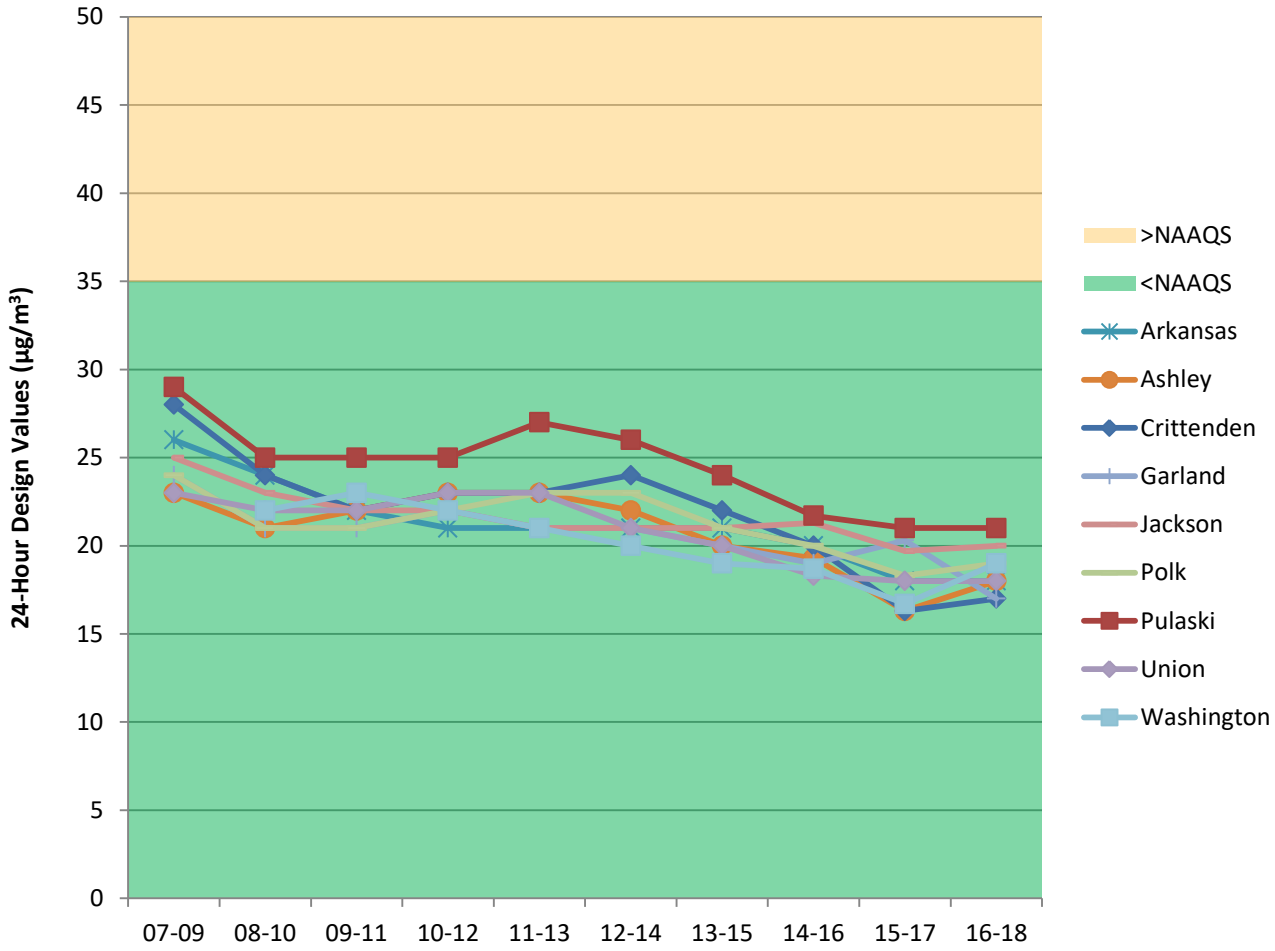
COUNTY	SITE ADDRESS	# OBS	TWENTY-FOUR-HOUR 98TH PERCENTILE ($\mu g/m^3$)	ANNUAL MEAN ($\mu g/m^3$)
Arkansas	1703 N Beurkle St - US Hwy 63, Stuttgart	118	19	8.3
Ashley	1015 Unity Rd, Crossett	121	21	8.1
Crittenden	LH Polk St and Colonial Dr, Marion	122	20	8.8
Garland	300 Werner St, Hot Springs	121	19	8.3
Garland	300 Werner St, Hot Springs	30	29	9
Jackson	7648 Victory Blvd, Newport	122	20	7.9
Polk	Hornbeck Rd, Mena	120	20	8.6
Pulaski	Pike Ave at River Rd, North Little Rock	357	21	9.3
Pulaski	Pike Ave at River Rd, North Little Rock	30	25	10.3
Pulaski	Doyle Springs Rd, Little Rock	121	22	9.7
Union	Union Memorial Hospital, El Dorado	119	21	8.8
Washington	600 S Old Missouri Rd, Springdale	122	25	8.4

Figure B-8 Trends in Annual PM2.5 Design Values



COUNTY	07-09	08-10	09-11	10-12	11-13	12-14	13-15	14-16	15-17	16-18	SLOPE	R^2
Arkansas	11.2	10.9	10.7	10.8	10.1	9.5	9.2	8.8	8.3	8.1	-0.3697	0.9684
Ashley	10.7	10.4	10.6	10.8	10.1	9.3	8.7	8.4	8.2	8.2	-0.3394	.8829
Crittenden	11.7	11.1	11.1	11.2	10.6	9.8	9.3	8.8	8.4	8.4	-0.4036	0.9476
Garland	11.1	10.7	10.8	11	10.5	9.7	9	9.4	9.5	8.4	-0.2818	0.8348
Jackson	10.8	10.5	10.8	10.8	10.5	9.8	9.2	8.6	8.2	8.1	-0.3448	0.8775
Polk	10.8	10.5	10.8	10.8	10.5	9.8	9.2	8.6	8.2	8.3	-0.3339	0.8708
Pulaski	12.1	12	12.1	12.2	11.7	11.1	10.7	10.5	10.5	9.7	-0.2739	0.8890
Union	11.2	10.8	11.1	11.4	10.7	9.8	9.1	8.9	8.9	8.9	-0.3200	0.8318
Washington		10.7	11	10.8	10.2	9.2	8.6	8.2	7.9	8.1	-0.4417	0.9067

Figure B-9 Trends in Twenty-Four Hour $PM_{2.5}$ Design Values

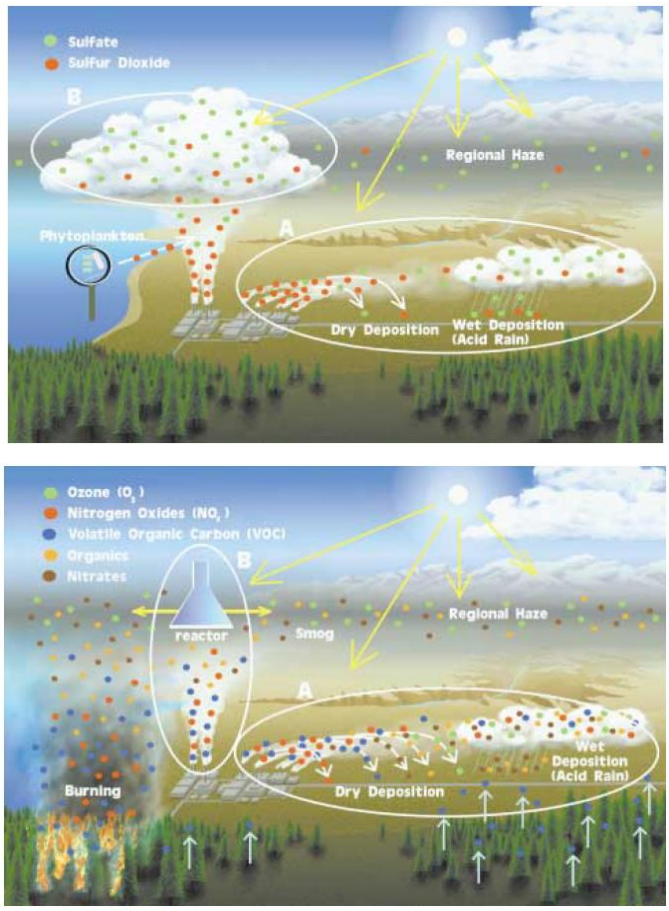


COUNTY	07-09	08-10	09-11	10-12	11-13	12-14	13-15	14-16	15-17	16-18	SLOPE	R^2
Arkansas	26	24	22	21	21	21	21	20.0	18.0	18	-0.7515	0.8693
Ashley	23	21	22	23	23	22	20	19.3	16.3	18	-0.6145	0.6437
Crittenden	28	24	22	23	23	24	22	20.0	16.3	17	-0.9994	0.7669
Garland	24	21	21	22	21	21	20	19.0	20.3	17	-0.5085	0.7082
Jackson	25	23	22	22	21	21	21	21.3	19.7	20	-0.4521	0.7962
Polk	24	21	21	22	23	23	21	20.0	18.3	19	-0.4358	0.5264
Pulaski	29	25	25	25	27	26	24	21.7	21.0	21	-0.7303	0.7088
Union	23	22	22	23	23	21	20	18.3	18.0	18	-0.6212	0.7959
Washington		22	23	22	21	20	19	18.7	16.7	19	-0.6583	0.8035

Regional Haze

The Clean Air Act mandates that the states and federal partners work to restore pristine visibility conditions in designated Class I areas and prevent future visibility impairment. There are 156 Class I areas, which include national parks, wildlife refuges, and wilderness areas. States, EPA, and federal land managers are charged to work together to monitor and address visibility impairment from anthropogenic sources.

The Regional Haze Program was established by EPA pursuant to this Clean Air Act mandate. Under the Regional Haze Regulations, states must develop plans covering ten year periods with the goal of achieving natural visibility conditions at designated Class I areas by 2064.



National Park Service (1999) "Introduction to Visibility"

Interagency Monitoring of Protected Visual Environments Monitoring Network

The IMPROVE network is a long-term monitoring program that tracks changes in visibility. The IMPROVE monitors are capable of speciation of haze-causing pollutants so that the causal mechanism of visibility impairment in each Class I area can be determined.

There are two IMPROVE monitors in Arkansas: one near the Caney Creek Wilderness Area and the other in the Upper Buffalo Wilderness Area.

Forest Service Caney Creek IMPROVE monitor (CACR1)

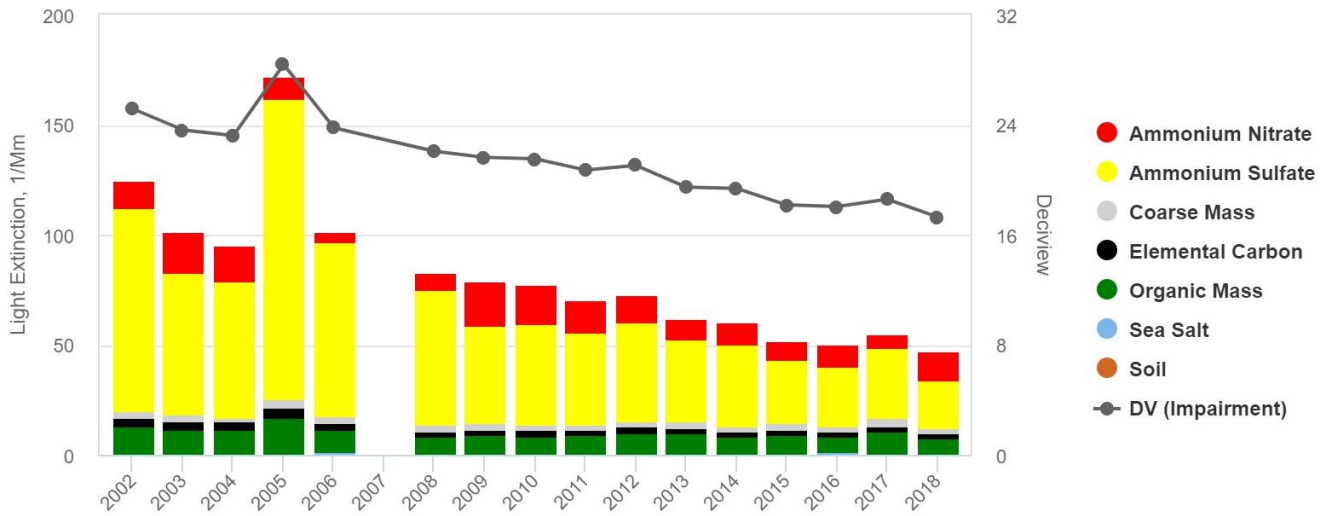
Caney Creek Wilderness Area

Caney Creek – Twenty Percent Most Impaired Days, 2002: Winhaze Visual Air Quality Modeler Image

Caney Creek – Twenty Percent Most Impaired Days, 2017: Winhaze Visual Air Quality Modeler Image

Figure B-10 shows annual visibility tracking metrics for the twenty percent most impaired days at Caney Creek. Visibility impairment on the most impaired days has decreased over time at Caney Creek as light extinction due to ammonium sulfate, organic mass, and elemental carbon has decreased. Light extinction due to ammonium nitrate, coarse mass, and soil has fluctuated over time, but no apparent trend is evident. Light extinction due to sea salt has increased over time.

Figure B-10 Annual Extinction Composition, Most Impaired Days, 2002-2018: Caney Creek Wilderness Area



IMPROVE Monitor: CACR1; Class I Areas: Caney Creek Wilderness

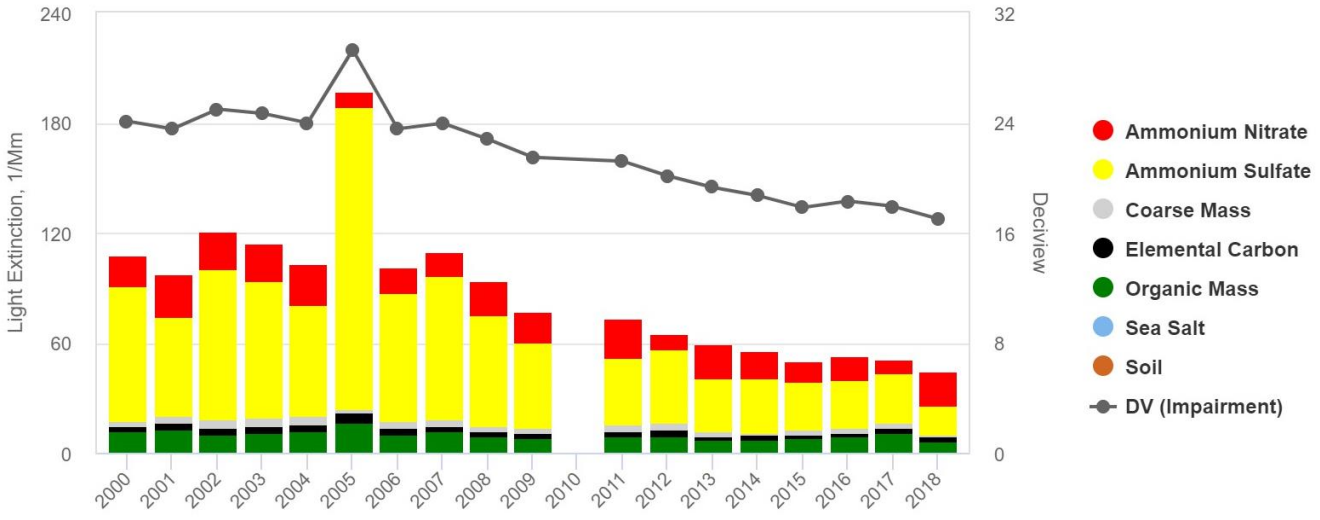
Upper Buffalo Wilderness Area

Upper Buffalo, Twenty Percent Most Impaired Days, 2002: Winhaze Visual Air Quality Modeler Image

Upper Buffalo, Twenty Percent Most Impaired Days, 2017: Winhaze Visual Air Quality Modeler Image

Figure B-11 shows annual visibility tracking metrics for the twenty percent most impaired days at Upper Buffalo. Visibility impairment on the most impaired days has decreased over time at Upper Buffalo as light extinction due to ammonium sulfate—and to a lesser extent coarse mass, elemental carbon, organic mass and soil—has decreased. Light extinction due to ammonium nitrate has fluctuated over time, but no trend is apparent.

Figure B-11 Annual Extinction Composition, Most Impaired Days, 2000-2018: Upper Buffalo Wilderness Area



IMPROVE Monitor: UPBU1; Class I Areas: Upper Buffalo Wilderness

Appendix C: Emissions Inventory Trends

National Emissions Inventory

Every three years, the United States Environmental Protection Agency (EPA), in collaboration with the states, collects data on criteria pollutant emissions. EPA publishes the data in the National Emissions Inventory (NEI), which provides information about the estimated emissions of criteria pollutants and their precursors from various source categories. The Division of Environmental Quality (DEQ) provides EPA with emissions estimates reported by larger stationary sources for inclusion in the NEI. EPA estimates emissions from smaller stationary sources, nonpoint sources, biogenic sources, mobile sources, and event sources.

The nonpoint source category includes small stationary sources too small to report as point, as well as biogenic sources—vegetation and other natural sources of emissions. The mobile source category is split into two subcategories: onroad vehicles and nonroad vehicles. Wildfires and prescribed burns fall into the event category.

This Appendix presents trends in anthropogenic emissions for the three most recent NEI years: 2011, 2014, and 2017.

EMISSION SOURCE CATEGORY	EXAMPLES
Point	Larger Stationary Sources
Nonpoint	Residential heating, solvents, agriculture, road dust
Biogenic	Crops, lawns, trees, soils
Onroad	Passenger vehicles, trucks, buses
Nonroad	Aircraft, locomotive, marine vessels
Event	Wildfires, prescribed burns

ANTHROPOGENIC VS NATURAL EMISSIONS

▲ ANTHROPOGENIC SOURCE EMISSIONS

All point sources, nonroad sources, and onroad sources are anthropogenic sources of emissions. Most nonpoint sources, with the exception of biogenic sources, are considered anthropogenic sources.

▲ NATURAL SOURCE EMISSIONS

All biogenic sources are natural sources of emissions. Event sources—such as volcanic emissions, dust storms, and wild-fires—are also natural emissions sources. There is some disagreement as to whether prescribed burns should be considered anthropogenic. For this trends analysis, all event sources are considered natural.

Trends in Anthropogenic Nitrogen Oxides Emissions

Nitrogen oxides (NOx) are precursors for multiple criteria pollutants including ozone and fine particulate matter ($PM_{2.5}$). Approximately eighty-eight percent of total NOx emissions in Arkansas come from anthropogenic sources.[8] The primary anthropogenic contributors to NOx emissions in Arkansas are mobile sources—particularly onroad vehicles—and point sources.

Overall, NOx emissions from anthropogenic sources decreased by eight percent between 2008 and 2014.[9] Onroad NOx emissions decreased by approximately seventeen percent, non-road NOx emissions decreased by twenty-four percent, and point source NOx emissions decreased by two percent between 2008 and 2014. Nonpoint source NOx emissions increased by approximately eighteen percent between 2008 and 2014.

Figure C-1 2014 Relative Contribution of Anthropogenic NOx Emissions in Arkansas by Source Category

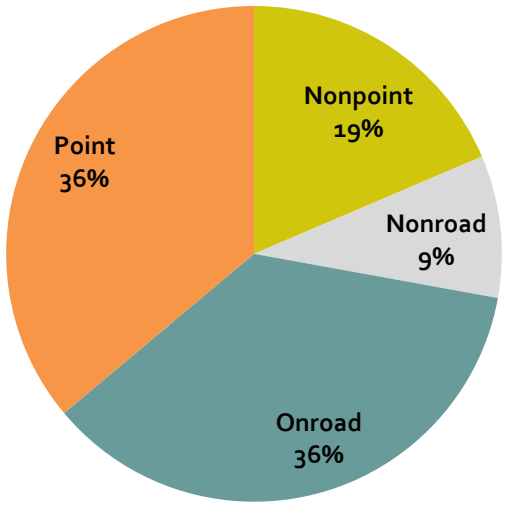
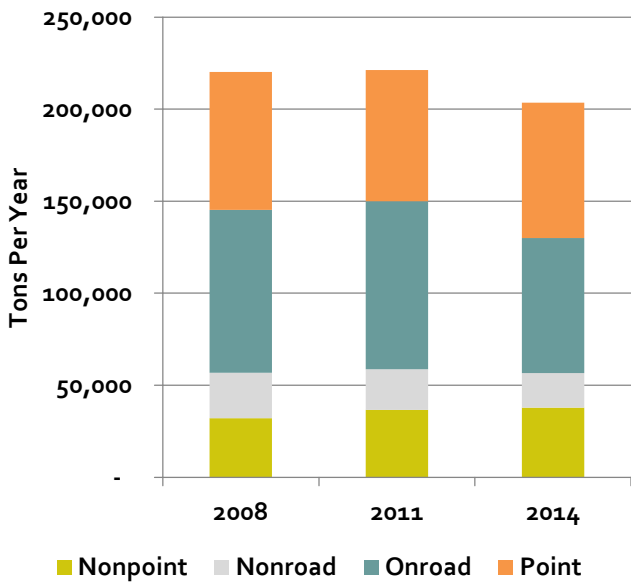


Figure C-2 Trends in Anthropogenic NOx Emissions in Arkansas by Data Category



[8] Source: 2014 National Emissions Inventory version 1
[9] Source: 2008 National Emissions Inventory version 3, 2011 National Emissions Inventory version 2, 2014 National Emissions Inventory version 1

Volatile organic compounds (VOCs) are precursors for ozone. Only ten percent of total VOC emissions in Arkansas come from anthropogenic sources.[10] Emissions from nonpoint sources comprise the largest portion (fifty-three percent) of the Arkansas anthropogenic VOC emissions inventory.

Overall, VOC emissions from anthropogenic sources in Arkansas decreased by approximately twelve percent between 2008 and 2014.[11] Emissions from nonpoint sources increased by six percent between 2008 and 2014. Emissions from nonroad, onroad, and point sources decreased during the same time period. The largest reduction (thirty-five percent) in emissions occurred in the on-road source category.

Figure C-3 2014 Relative Contribution of Anthropogenic VOC Emissions in Arkansas by Source Category

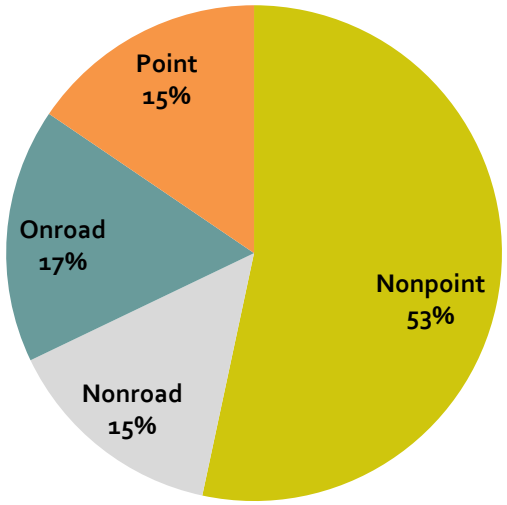
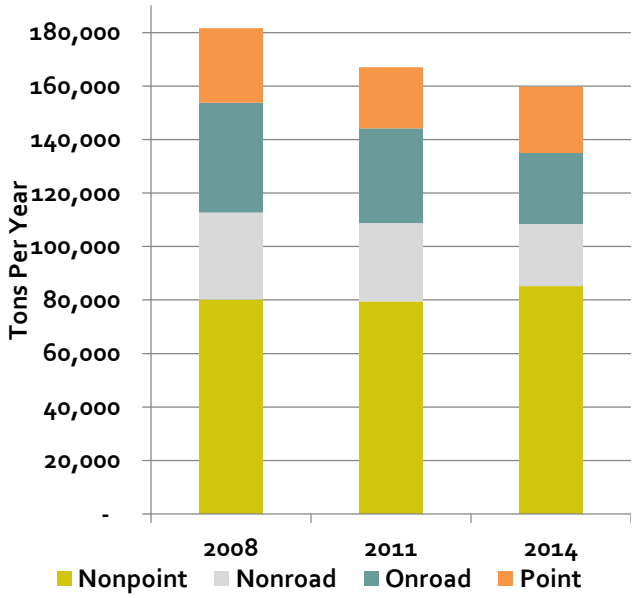


Figure C-4 Trends in Anthropogenic VOC Emissions in Arkansas by Data Category



[10] Source: 2014 National Emissions Inventory version 1
[11] Source: 2008 National Emissions Inventory version 3, 2011 National Emissions Inventory version 2, 2014 National Emissions Inventory version 1

Overall, CO emissions from anthropogenic sources decreased by thirty-five percent between 2008 and 2014.[12] Onroad and nonroad CO emissions dropped sharply by approximately forty-five percent and thirty percent, respectively. Nonpoint CO emissions decreased by approximately thirteen percent between 2008 and 2014 and point CO emissions decreased by approximately eight percent.

Carbon monoxide (CO) is both a criteria pollutant and a precursor for ozone. Approximately forty-three percent of total Arkansas CO emissions come from anthropogenic sources.[13] Emissions from onroad sources comprise the largest portion (forty-eight percent) of the Arkansas anthropogenic CO emissions inventory.

Figure C-5 2014 Relative Contribution of Anthropogenic CO Emissions in Arkansas by Source Category

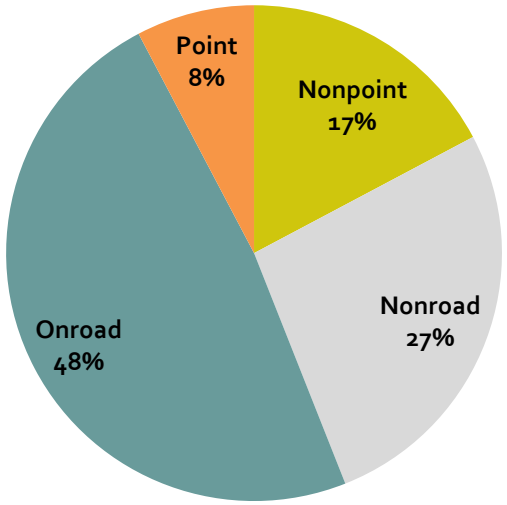
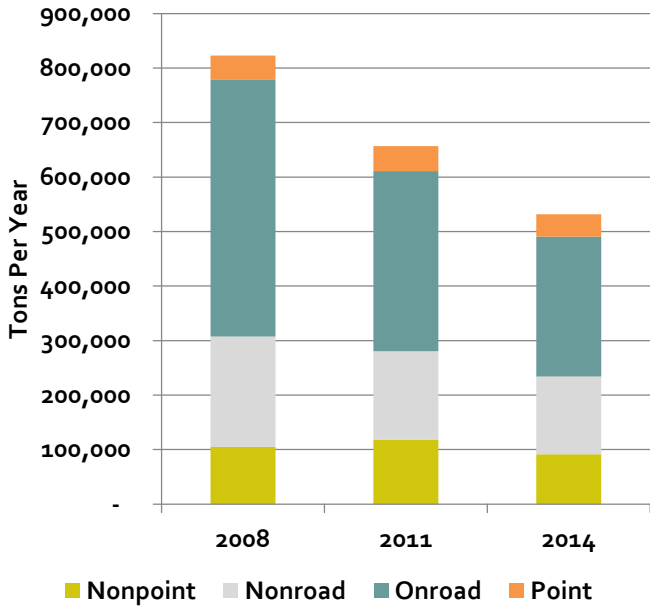


Figure C-6 Trends in Anthropogenic CO Emissions in Arkansas by Data Category



[12] Source: 2008 National Emissions Inventory version 3, 2011 National Emissions Inventory version 2, 2014 National Emissions Inventory version 1
[13] Source: 2014 National Emissions Inventory version 1

Overall, SO_2 emissions from anthropogenic sources decreased by approximately three percent between 2008 and 2014. SO_2 emissions from point sources decreased by approximately two percent.[14] SO_2 emissions from onroad sources decreased by fifty-six percent. SO_2 emissions from nonroad sources decreased by ninety-one percent. SO_2 emissions from nonpoint sources increased from 2008 to 2011, but decreased by thirty-nine percent between 2008 and 2014.

Sulfur dioxide (SO_2) is both a criteria pollutant and a precursor for fine particulate matter ($PM_{2.5}$). Virtually all SO_2 emissions come from anthropogenic sources.[15] Emissions from point sources comprise the largest portion (ninety-nine percent) of the Arkansas anthropogenic SO_2 emissions inventory.

Figure C-5 2014 Relative Contribution of Anthropogenic SO_2 Emissions in Arkansas by Source Category

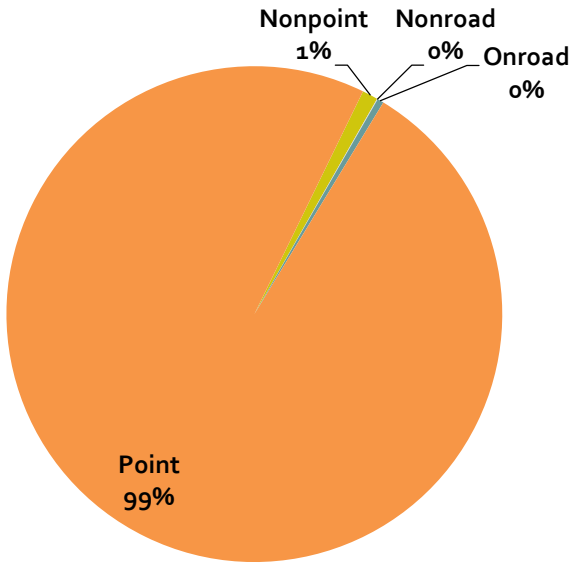
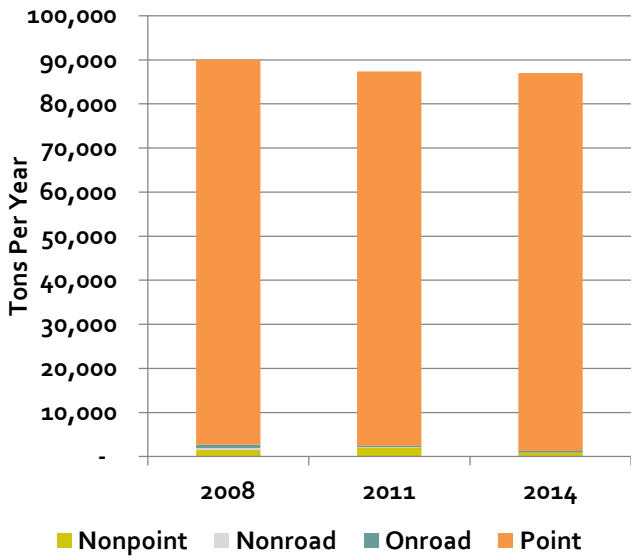


Figure C-6 Trends in Anthropogenic SO_2 Emissions in Arkansas by Data Category



[14] Source: 2008 National Emissions Inventory version 3, 2011 National Emissions Inventory version 2, 2014 National Emissions Inventory version 1
[15] Source: 2014 National Emissions Inventory version 1

Coarse particulate matter (PM_{10}) is a criteria pollutant. Approximately ninety-one percent of Arkansas PM_{10} emissions come from anthropogenic sources.[16] Emissions from nonpoint sources comprise the largest portion (ninety-seven percent) of the Arkansas anthropogenic PM_{10} emissions inventory.

Overall, Arkansas experienced approximately a forty-one percent increase in PM_{10} emissions from anthropogenic sources between 2008 and 2014.[17] Emissions from point and nonroad source categories decreased. Nonpoint source emissions increased by forty-three percent and onroad emissions increased by twenty-six percent.

Figure C-7 2014 Relative Contribution of Anthropogenic PM_{10} Emissions in Arkansas by Source Category

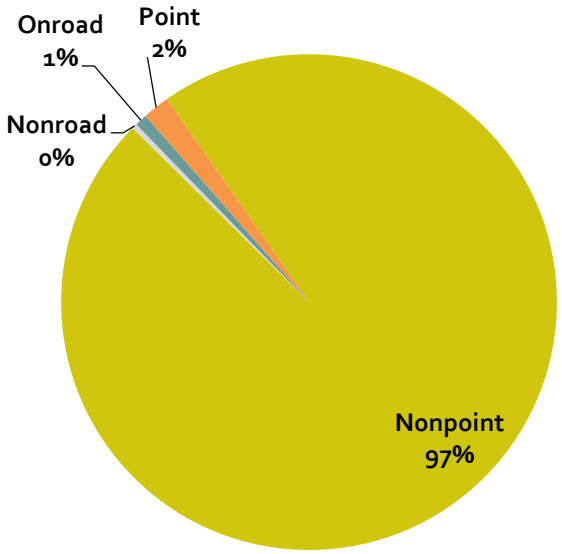
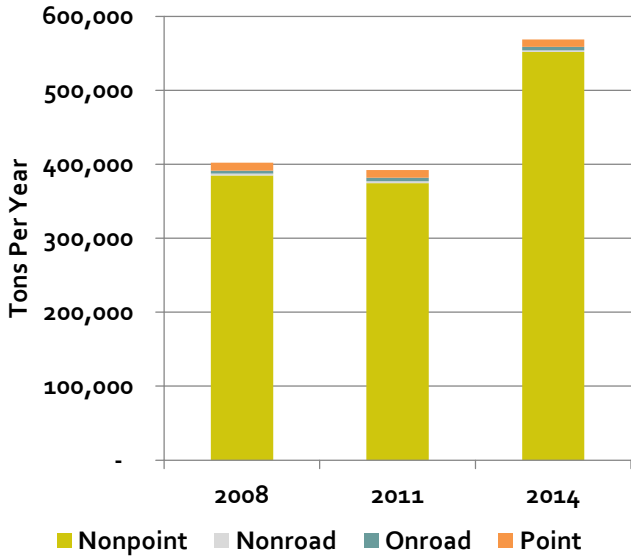


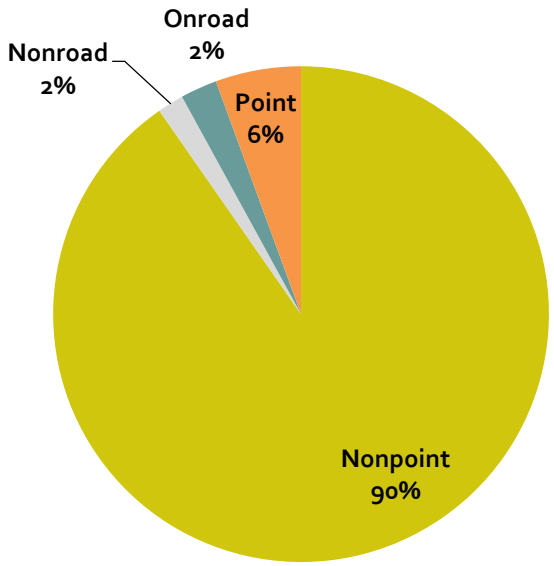
Figure C-8 Trends in Anthropogenic PM_{10} Emissions in Arkansas by Data Category



[16] Source: 2014 National Emissions Inventory version 1
[17] Source: 2008 National Emissions Inventory version 3, 2011 National Emissions Inventory version 2, 2014 National Emissions Inventory version 1

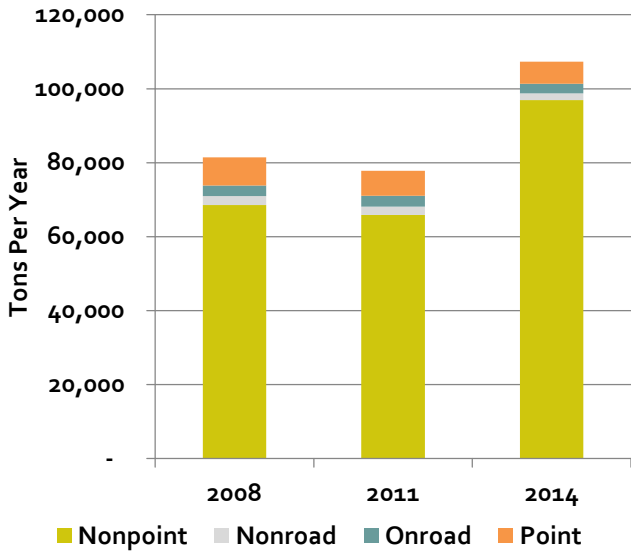
Primary fine particulate matter (primary $PM_{2.5}$) is the condensable and filterable fraction that is directly emitted from sources. Primary $PM_{2.5}$ does not include secondary $PM_{2.5}$ formed downwind by reactions between precursor pollutants, such as nitrogen oxides (NOx), sulfur dioxide (SO_2), and ammonia (NH_3). Approximately sixty-nine percent of primary $PM_{2.5}$ emissions in Arkansas come from anthropogenic sources.[18] Emissions from nonpoint sources comprise the largest portion of the Arkansas anthropogenic primary $PM_{2.5}$ emissions inventory.

Figure C-9 2014 Relative Contribution of Anthropogenic $PM_{2.5}$ Emissions in Arkansas by Data Category



Overall, primary $PM_{2.5}$ emissions increased between 2008 and 2014 as a result of an increase in emission estimates from the nonpoint source category and from two sectors not regulated by DEQ or EPA: agriculture—crop and livestock dust—and unpaved road dust.[19] Emissions from point, onroad, and nonroad source categories decreased.

Figure C-10 Trends in Anthropogenic $PM_{2.5}$ Emissions in Arkansas by Source Category



[18] Source: 2014 National Emissions Inventory version 1
[19] Source: 2008 National Emissions Inventory version 3, 2011 National Emissions Inventory version 2, 2014 National Emissions Inventory version 1

Ammonia (NH_3) is a precursor for fine particulate matter ($PM_{2.5}$). Approximately eighty-nine percent of NH_3 emissions in Arkansas come from anthropogenic sources.[20] Emissions from nonpoint sources comprise the largest portion (ninety-six percent) of the Arkansas anthropogenic NH_3 emissions inventory from source categories regulated by state and federal air quality programs.[21]

Overall, NH_3 emissions from anthropogenic sources decreased by approximately thirty-nine percent between 2008 and 2014. The overall decrease in NH_3 emissions resulted from a forty percent decrease in nonpoint source NH_3 emissions between 2008 and 2014. Onroad sources of NH_3 emissions also decreased between 2008 and 2014. Nonroad and point source emissions increased between 2008 and 2014.

Figure C-11 2014 Relative Contribution of Anthropogenic $PM_{2.5}$ Emissions in Arkansas by Data Category

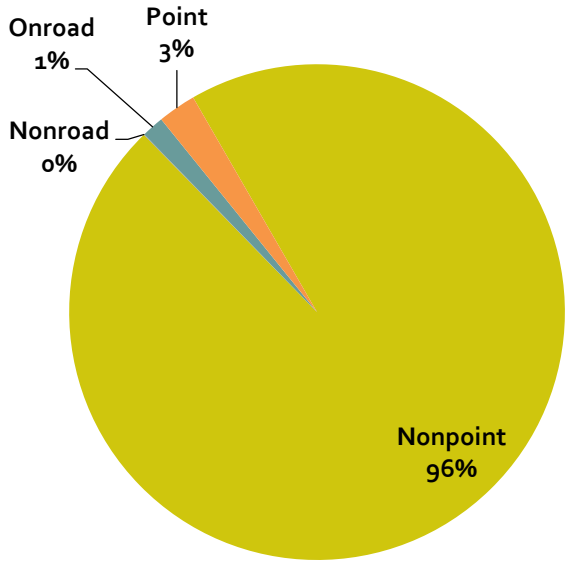
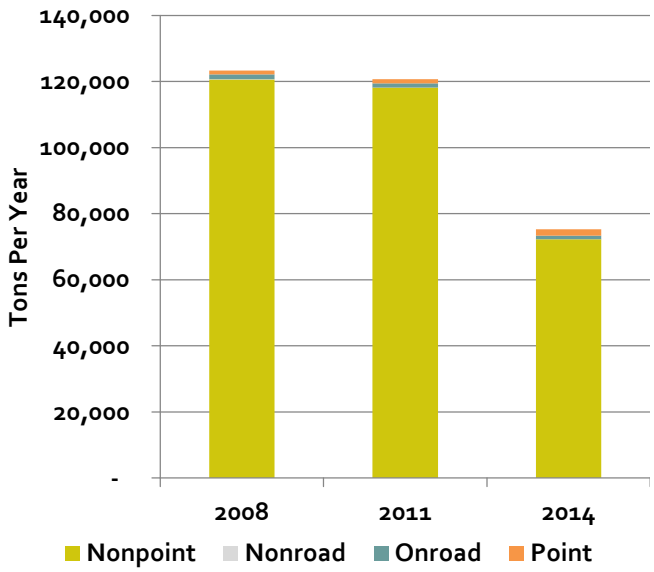


Figure C-12 Trends in Anthropogenic $PM_{2.5}$ Emissions in Arkansas by Data Category



[20] 2014 National Emissions Inventory version 1
[21] Id.

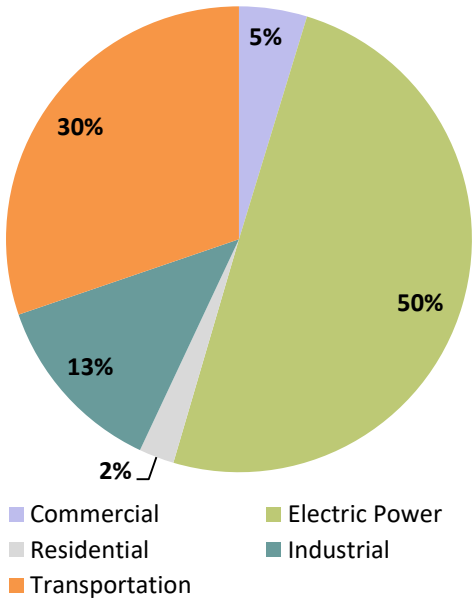
Carbon Dioxide Trends

Carbon dioxide (CO_2) accounts for 82% of all United States anthropogenic greenhouse gas emissions.[22] Greenhouse gases trap heat in the atmosphere.

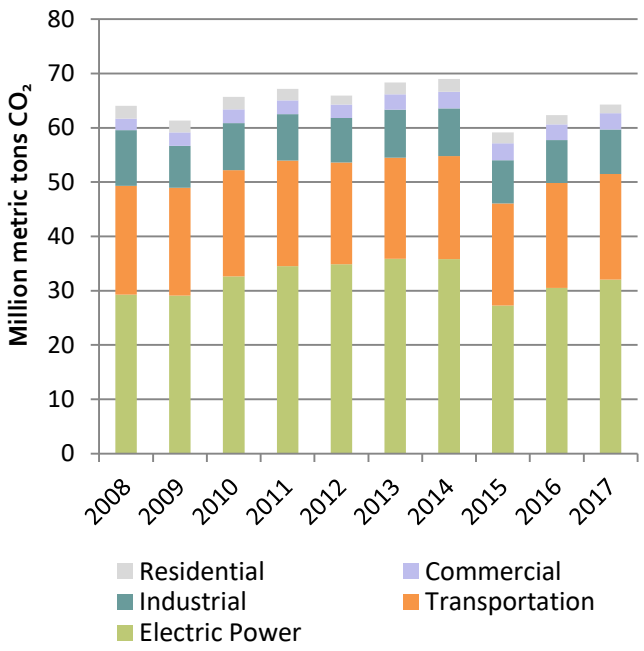
CO_2 is naturally present in the atmosphere, but is also emitted by human activities, including fossil fuel combustion, industrial processes, and land-use changes.

The United States Energy Information Administration (EIA) inventories energy-related CO_2 emissions. In Arkansas, the largest source of anthropogenic CO_2 emissions is the electric power sector followed by the transportation sector. Over the past decade, CO_2 emissions from the electric power sector in Arkansas have increased, reaching a peak of 35.9 million metric tons in 2013. Emissions from Arkansas's power sector declined in 2015, but have trended upward since 2016. CO_2 emissions from the transportation sector decreased from 2008-2013, but have increased slightly each year since. The industrial sector in has decreased its CO_2 emissions over the past decade. The residential sector and commercial sector make up much smaller portions of the energy-related CO_2 emissions inventory in Arkansas.

C-13 Arkansas 2017 Relative Carbon Dioxide Emissions By Energy-Related Sector (EIA State Carbon Dioxide Emissions Data)



C-14 2008–2017 Trends in Energy-Related CO2 Emissions in Arkansas (EIA State Carbon Dioxide Emissions Data)



[22] EPA (2017). "Overview of Greenhouse Gases" https://www.epa.gov/ghgemissions/overview-greenhouse-gases

Appendix D: 2019 Ozone Season Summary

Introduction

Ozone is a gas that can be beneficial or harmful, depending on where it is found. In the stratosphere, ozone forms a protective layer that shields the planet from ultraviolet rays. At ground level, ozone is unhealthy to breathe and can trigger various respiratory and cardiovascular health problems. Ground level ozone also has negative impacts on vegetation and ecosystems.

Ground level ozone is produced via photochemical reactions involving nitrogen oxides (NOx), volatile organic compounds (VOCs), and sunlight. Local meteorology—including temperature, wind speed and direction, humidity, solar radiation, and cloud cover—affects ozone formation.

The United States Environmental Protection Agency (EPA) has established a national ambient air quality standard (NAAQS) for ozone at a level of 70 ppb (0.070 ppm) to protect public health and welfare. The Division of Environmental Quality (DEQ) monitors air quality in Arkansas and implements a permitting program to ensure that sources of precursor compounds, such as NOx and VOCs, do not interfere with attainment and maintenance of the ozone NAAQS.

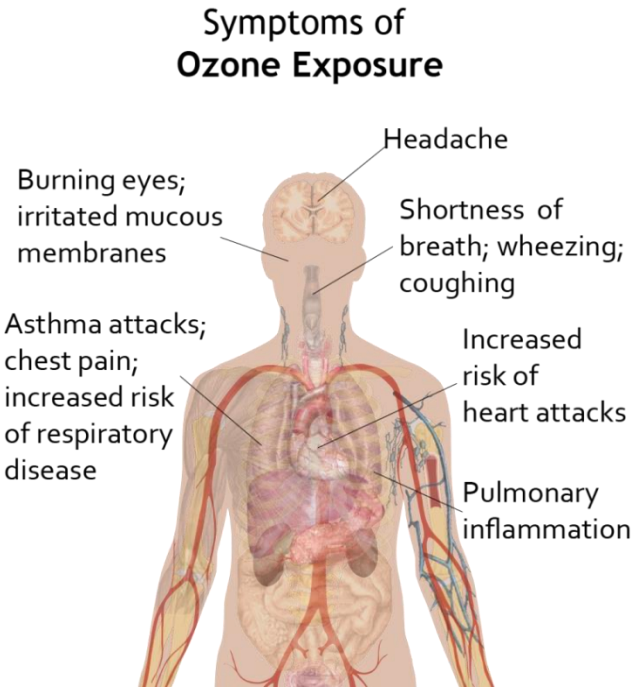


Photo of healthy (top) and ozone-injured (bottom) tulip poplar tree foliage. National Park Service

Ozone Season

Between May 1 and September 30 each year, conditions are typically more conducive for ozone formation than at other times of the year. This period is known as ozone season.

During the ozone season, DEQ reports current air quality conditions and forecasts day-ahead air quality conditions for two major metropolitan areas in Arkansas: central Arkansas and northwest Arkansas. The Tennessee Department of Environment and Conservation reports and forecasts conditions in the Memphis metropolitan area, which includes West Memphis, Arkansas.

Current air quality conditions and forecasts are presented to the public in the form of the Air Quality Index (AQI). The AQI ranges from 0–500[23] with an easy-to-recognize color system. The AQI colors are intended to help people to rapidly determine whether air pollutants are reaching unhealthy levels. Current and next-day AQI for central and northwest Arkansas are posted daily on DEQ's website[24] and reported in the media. AQI for metropolitan areas throughout the nation are posted to EPA's Air Now webpage.[25]

Table D-1 AQI Breakdown for the 8-Hour Ozone NAAQS

INDEX VALUES	8-HOUR OZONE AVERAGE (ppm)	LEVELS OF HEALTH CONCERN
0–50	0.000–0.054	Good
51–100	0.055–0.070	Moderate
101–150	0.071–0.085	Unhealthy for Sensitive Groups
151–200	0.086–0.105	Unhealthy
201–300	0.106–0.200	Very Unhealthy

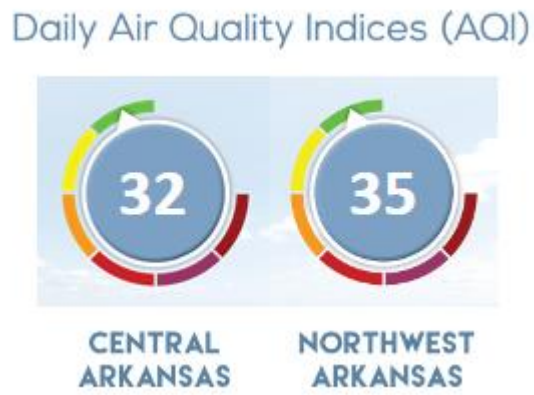


Table D-2 Arkansas Yearly Highest Ozone AQI

AQI	DATE
87	5/31/2019
122	6/6/2018
115	6/9/2017
100	6/9/2016
100	6/5/2015
100	7/22/2014

[23] For the 8-hour ozone standard, AQI values above 300 are not calculated.
[24] www.adeq.state.ar.us
[25] www.airnow.gov

Ozone Action Days

Ozone Action Days is a central Arkansas program (coordinated through Metroplan and DEQ's Arkansas Clean Cities Program) that is implemented in cooperation with the OAQ, Arkansas Department of Health and the Arkansas Department of Transportation.

There are two types of ozone action days:

Ozone Action Advisory—Code Orange

Declared when AQI forecast is code orange (AQI 101–150), indicating that prolonged outdoor exertion is **UNHEALTHY FOR SENSITIVE GROUPS.**

Ozone Action Alert—Code Red

Declared when the AQI forecast is code red (AQI 151–200), indicating that prolonged exertion is **UNHEALTHY FOR EVERYONE.**

DOs AND DON'Ts FOR OZONE ACTION DAYS

▲ DOs

-Limit driving. Share a ride, carpool, walk, or ride the bus.

-Combine errands.

-Keep your car well-tuned.

-Avoid "jackrabbit" starts (forceful accelerations) or excessive idling.

-Stay indoors as much as possible.

▲ DON'Ts

-Don't do lawn and gardening chores that use gasoline powered equipment.

-Don't use oil-based paints and solvents.

-Don't use products that release fumes or evaporate easily.

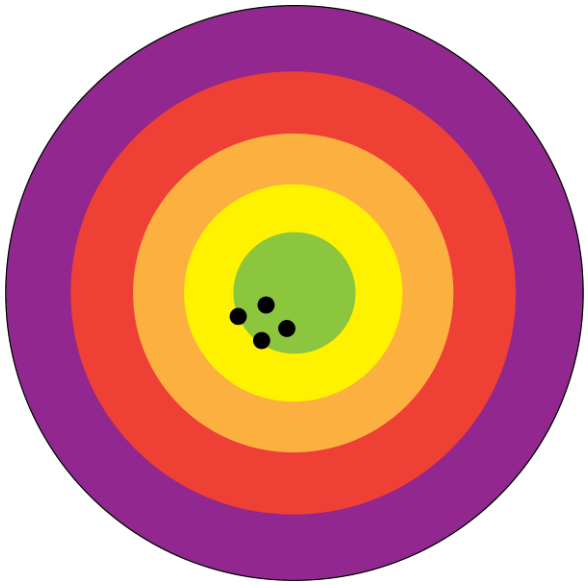
-Don't refuel or if you must refuel, do so after dark and don't fill the tank completely.

-Don't exercise outdoors.

DEQ 2019 Ozone Forecasting Accuracy

Ozone concentrations are forecasted daily during the ozone season. The DEQ air quality forecaster estimates ozone concentrations using meteorological data and recent pollutant concentrations.

During 2019, DEQ correctly forecasted whether the next day would be an ozone action day (Code Orange or Code Red) one hundred percent of the time. ADEQ's accuracy for forecasting whether a day would be good (AQI in Green range) or Moderate (AQI in Yellow range) was eighty-two percent.

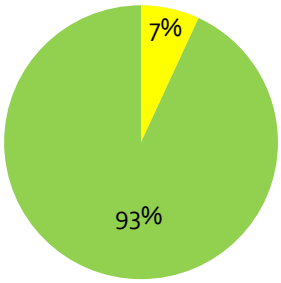


Central Arkansas 2019 Ozone Season Overview

Two ozone monitors collect data to determine the air quality of Central Arkansas. Both are located in North Little Rock.

During ozone season 2019, there were no **Code Orange** AQI days in Central Arkansas based on monitor data. Three-hundred thirty-seven days were well below the ozone NAAQS (AQI 0–50, Green). Monitored values for twenty-five days in the 2019 ozone season fell in the AQI range of 51–100 (Yellow).

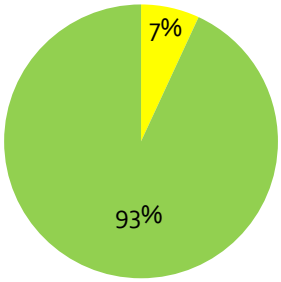
Figure D-1 Central Arkansas 2019 Ozone Season Monitored Days by AQI Color



Northwest Arkansas 2019 Ozone Season Overview

Two ozone monitors in Northwest Arkansas, one in Springdale and the other in Fayetteville, collect ozone concentration data for northwest Arkansas. During ozone season 2019, there were no **Code Orange** AQI days, twenty-five yellow days, and three-hundred thirty-seven green days based on monitor data.

Figure D-2 Northwest Arkansas 2019 Ozone Season Monitored Days by AQI Color

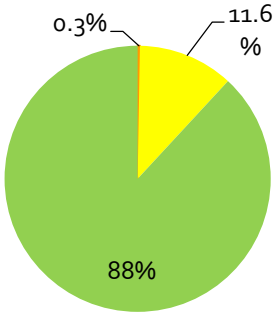


Marion 2019 Ozone Season Overview

There is one ozone monitor located in Marion, Arkansas, which is part of the Memphis metropolitan statistical area.

During the 2019 ozone season, Marion had one **Code Orange** AQI day, forty-two yellow days, and three-hundred nineteen green days based on monitor data.

Figure D-3 Marion 2019 Ozone Season Monitored Days by AQI Color



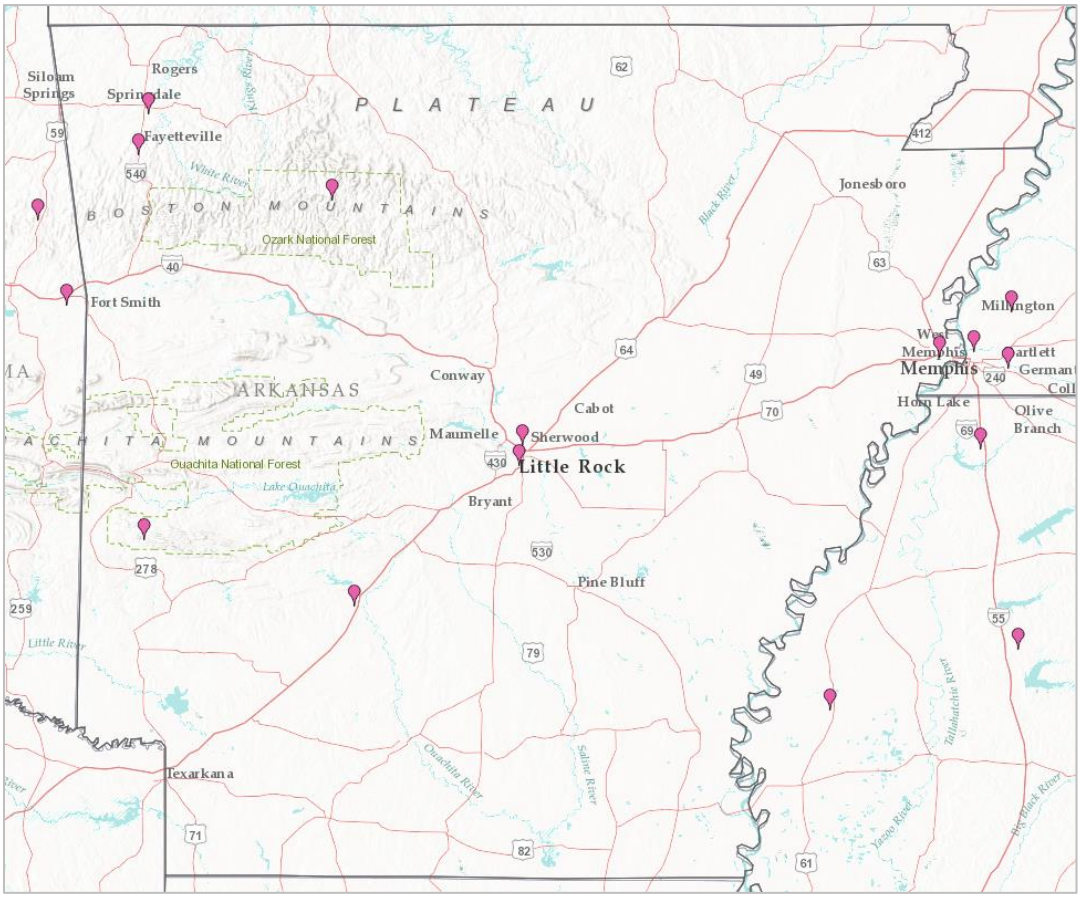
2019 Running Design Values

Compliance with the ozone NAAQS is determined based on design values for each monitor. The design value for ozone is the fourth highest eight-hour daily maximum averaged over three years. If the design value for an area is below the level of the NAAQS, the area is said to be in "attainment" with the NAAQS. If the design value is higher than the NAAQS, the area is designated as "nonattainment" and the State must enact emission reduction measures to bring the area back into attainment with the NAAQS. Most monitors are located in metropolitan statistical areas; however, Arkansas does have a few rural monitors to provide data on background conditions.

Table D-3 2017–2019 Running Ozone Design Values

MONITORING LOCATION	RUNNING DESIGN VALUE*
Little Rock/North Little Rock/Conway MSA	0.062 ppm
Memphis MSA	0.068 ppm
Fayetteville/Springdale/Rogers MSA	0.062 ppm
Deer (Newton Co.)	≤0.061 ppm
Eagle Mountain (Polk Co.)	≤0.061 ppm
Caddo Valley (Clark Co.)	≤0.061 ppm

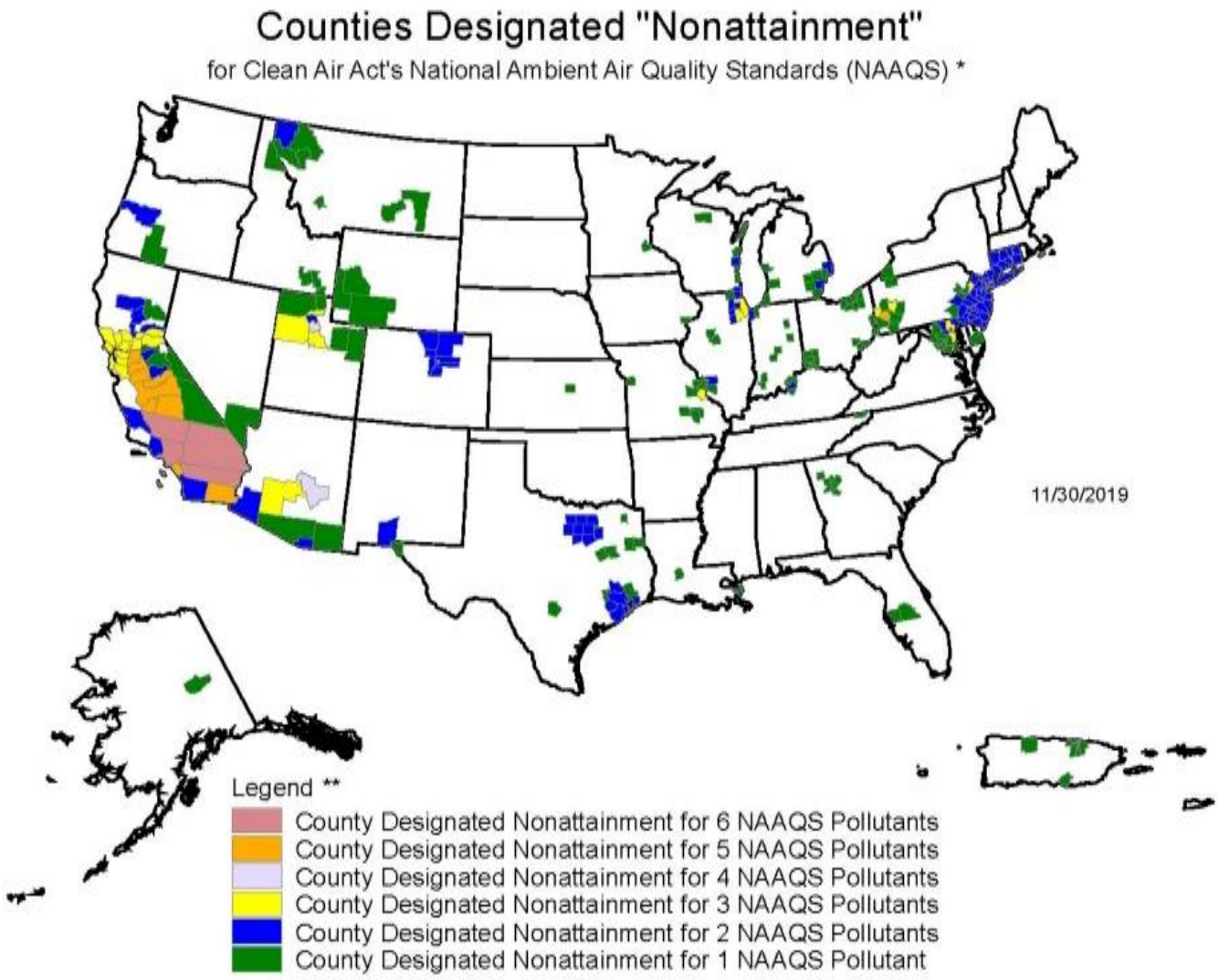
*The ozone NAAQS is 0.070 ppm (70 ppb).



Ozone monitors in Arkansas and on the periphery of adjacent states

Arkansas Ozone Attainment Status

The entire state of Arkansas is in attainment for the 2015 ozone NAAQS and for all other NAAQS.



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