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Appendix A Cross-State Air Pollution Rule Emission Reductions versus Federal Implementation Plan Nitrogen Oxides Reductions

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I. Introduction

Arkansas has included in this state implementation plan (SIP) revisions to address certain disapproved portions of the Arkansas Regional Haze State Implementation Plan (AR RH SIP), submitted to the United States Environmental Protection Agency (EPA) in 2008. In 2012, EPA partially approved and partially disapproved the 2008 AR RH SIP.[1] Specifically, EPA disapproved the following elements of the 2008 AR RH SIP:

- Best available retrofit technology (BART) compliance dates;
- (BART) eligible sources and subject-to-BART Sources;
- BART determinations:
  - Sulfur dioxide (SO_2), nitrogen dioxide (NOx), and particulate matter (PM) BART determinations for Arkansas Electric Cooperative Corporation (AECC) Bailey Plant Unit 1;
  - SO_2, NOx, and PM BART determinations for AECC McClellan Plant Unit 1;
  - SO_2 and NOx BART determinations for American Electric Power (AEP)/Southwest Power Company (SWEPCO) Flint Creek Plant Boiler No. 1;
  - SO_2, NOx, and PM BART determinations for the fuel oil firing scenario and NOx BART determination for the natural gas firing scenario at Entergy Arkansas, Inc. (Entergy) Lake Catherine Plant Unit 4;
  - SO_2 and NOx BART determinations under both bituminous and sub-bituminous coal firing scenarios for Entergy White Bluff Units 1 and 2;
  - BART determination for Entergy White Bluff Plant Auxiliary Boiler;
  - SO_2 and NOx BART determinations for Domtar Ashdown Mill Power Boiler No. 1; and
  - SO_2, NOx, and PM BART determinations for Domtar Ashdown Mill Power Boiler No. 2;
- Reasonable progress analysis and reasonable progress goals (RPGs); and
- Long-term strategy.

The remaining provisions of the 2008 AR RH SIP were approved.

This SIP revision replaces source-specific NOx BART determinations for the electric generating units (EGUs) included in the 2008 AR RH SIP, as well as NOx limits for the EGUs promulgated

[1] *Approval and Promulgation of Implementation Plans; Regional Haze State Implementation Plan; Interstate Transport State Implementation Plan to Address Pollution Affecting Visibility and Regional Haze.* (77 FR 14604, March 12, 2012)

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under a 2016 federal implementation plan[2] (FIP), with reliance on the Cross-State Air Pollution Rule (CSAPR) emissions trading program as an alternative to BART for Arkansas BART-eligible fossil fuel-fired electric generating units (EGUs) as allowed under 40 C.F.R. 308(e)(4). This SIP revision also establishes that no new NOx emission controls are required beyond CSAPR for achieving reasonable progress.

II. Background

In 1977, Congress added § 169 to the Clean Air Act (CAA), which set forth the following goal for restoring pristine conditions in national parks and wilderness areas:

> Congress hereby declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from man-made air pollution.

In 1980, EPA issued regulations to address the visibility problem that is "reasonably attributable" to a single source or small group of sources. These regulations primarily addressed "plume blight"—visual impairment of air quality that manifests itself as a coherent plume—rather than overall haze. In 1988, EPA, the states, and federal land managers (FLMs) began monitoring fine particulate matter concentrations and visibility in thirty Class I areas to better understand the species of particulates causing visibility impairment.

When the CAA was amended in 1990, Congress added § 169(B), which authorized research and regular assessments of progress toward restoring visibility in Class I areas and authorized the creation of visibility transport commissions. Specifically, CAA §169(B)(f) mandated the creation of the Grand Canyon Visibility Transport Commission (GCVTC) to make recommendations to EPA for regions affecting the visibility of the Grand Canyon National Park. EPA relied upon the recommendations of GCVTC and research reports to develop the 1999 "Regional Haze Regulations: Final Rule" (RHR).[3]

The 1999 RHR sought to address the combined visibility effects of various pollution sources over a wide geographic region with the goal of achieving natural visibility conditions at designated Class I areas by 2064. This required all states, including those that did not have Class I areas to participate in planning, analysis, and emission control

[2] *Promulgation of Air Quality Implementation Plans; State of Arkansas; Regional Haze and Interstate Visibility Transport Federal Implementation Plan; Final Rule* (81 FR 66332, September 27, 2016)
[3] 64 FR 35714

programs under the RHR. States with Class I areas were required to conduct certain analyses to establish goals for each Class I area in the state to 1) improve visibility on the haziest days and 2) ensure no degradation occurs on the clearest days. These goals and long-term strategies to achieve these goals were to be included in SIPs covering each ten-year period leading up to 2064. States were also required to submit progress reports in the form of SIP revisions every five years. Around the time of the 1999 RHR, EPA and the FLMs also expanded the existing Class I visibility monitoring network to 108 Class I areas.

For the purposes of assisting with coordination and cooperation among states to address visibility issues, EPA designated five regional planning organizations (RPOs) to assist with coordination and cooperation among states in addressing visibility issues the states have in common. Arkansas was located in the Central Regional Air Planning Association (CENRAP) RPO. Figure 1 is a map depicting the five RPO regions designated by EPA.

Figure 1 Regional Planning Organizations

In SIPs covering the first ten-year period, states were also specifically required to evaluate controls for certain sources that were not in operation prior to 1962, were in existence in 1977, and have the potential to emit 250 tons per year or more of any air pollutant. These sources were referred to as “BART-eligible sources.” States were required to make BART determinations for all BART-eligible sources or consider exempting some sources from BART requirements because they do not cause or

contribute to visibility impairment in a Class I area. BART-eligible sources that were determined to cause or contribute to visibility impairment in a Class I area were subject to BART controls. In determining BART emission limits for each subject-to-BART source, States were required to take into account the existing control technology in place at the source, the cost of compliance, energy and non-air environmental impacts of compliance, remaining useful life of the source, and the degree of visibility improvement that is reasonably anticipated from use of each technology considered. States also had the flexibility to choose an alternative to BART, such as an emission trading program, that would achieve greater reasonable progress in visibility protection than implementation of source-by-source BART controls. SIPs for the first ten-year planning period were due on December 17, 2007.

In 2005, EPA issued a revised BART rule pursuant to a partial remand of the 1999 RHR by the U.S. Court of Appeals of the DC District Court in 2002.[4] The Court had remanded the BART provisions of the 1999 RHR to EPA and denied industry's challenge to the RHR goals of natural visibility and no degradation. The revised BART rule included guidelines for states to use in determining which facilities must install controls and the types of controls the facilities must use.

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In addition to revisions to BART, EPA has also issued rulemakings establishing the Clean Air Interstate Rule (CAIR) and its successor the Cross-State Air Pollution Rule (CSAPR) as approvable alternatives to source-by-source BART controls.[5] EPA has also amended regulatory requirements for state regional haze plans for the second planning period and beyond.[6]

On September 9, 2008, Arkansas submitted a SIP for the 2008–2018 planning period of regional haze regulations promulgated as of 2005 codified at 40 C.F.R. Part 51. In a 2012 action on the 2008 AR RH SIP, EPA partially approved and partially disapproved the SIP.[7] This partial approval/partial disapproval of the 2008 AR RH SIP triggered a requirement for EPA to either approve a SIP revision by Arkansas or promulgate a federal implementation plan (FIP) within twenty-four months of the final rule partially approving and partially disapproving the 2008 AR RH SIP.

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[4] *American Corn Growers Assn. v. EPA*, 291 F.3d.1 (D.C. Cir. 2002)

[5] *Regional Haze Regulations; Revisions to Provisions Governing Alternative to Source-Specific Best Available Retrofit Technology (BART) Determinations* (71, FR 60612, October 13, 2006)
Regional Haze Regulations; Revisions to Provisions Governing Alternative to Source-Specific Best Available Retrofit Technology (BART) Determinations, Limited SIP Disapprovals, and Federal Implementation Plans (77 FR 33642, June 7, 2012).

[6] *Protection of Visibility: Amendments to Requirements for State Plans* (82 FR 3078, January 10, 2017)

[7] *Approval and Promulgation of Implementation Plans; Regional Haze State Implementation Plan; Interstate Transport State Implementation Plan to Address Pollution Affecting Visibility and Regional Haze.* (77 FR 14604, March 12, 2012)

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In the 2012 partial approval/partial disapproval of the 2008 AR RH SIP, EPA approved the following elements of the 2008 AR RH SIP:

- Identification of Class I areas affected by sources in Arkansas;
- Determination of baseline and natural visibility conditions;
- Determination of a uniform rate of progress (URP);
- Select BART determinations:
    - PM determination on AEP Flint Creek Plant Boiler No. 1;
    - SO_2 and PM determinations for the natural gas firing scenario for Entergy Lake Catherine Plant Unit 4
    - PM determinations for both bituminous and sub-bituminous coal firing scenarios for Entergy White Bluff Plant Units 1 and 2;
    - PM determination for Domtar Ashdown Mill Power Boiler No. 1
- Consultation with FLMs and other states regarding RPGs and long-term strategy;
- Coordination of regional haze and reasonably attributable visibility impairment (RAVI);
- Regional haze monitoring strategy and other SIP requirements under 40 C.F.R. 51.308(d)(4);
- A commitment to submit periodic regional haze SIP revisions; and
- A commitment to submit periodic progress reports that include a description of progress toward RPGs and a determination of adequacy of the existing SIP.

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EPA disapproved the following elements of the 2008 AR RH SIP:

- BART compliance dates;
- BART-eligible sources and subject-to-BART sources;
- Select BART determinations:
    - SO_2, NOx, and PM BART determinations for AECC Bailey Plant Unit 1;
    - SO_2, NOx, and PM BART determinations for AECC McClellan Plant Unit 1;
    - SO_2 and NOx BART determinations for AEP Flint Creek Plant Boiler No. 1;
    - SO_2, NOx, and PM BART determinations for the fuel oil firing scenario and NOx BART determination for the natural gas firing scenario at Entergy Lake Catherine Plant Unit 4;
    - SO_2 and NOx BART determinations under both bituminous and sub-bituminous coal firing scenarios for Entergy White Bluff Units 1 and 2;
    - BART determination for Entergy White Bluff Plant Auxiliary Boiler;
    - SO_2 and NOx BART determinations for Domtar Ashdown Mill Power Boiler No. 1; and
    - SO_2, NOx, and PM BART determinations for Domtar Ashdown Mill Power Boiler No. 2;

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- Reasonable progress analysis and RPGs; and
- Long-term strategy.

On September 27, 2016, EPA finalized a regional haze FIP for Arkansas (AR RH FIP).[8] This FIP established new BART requirements for those sources whose BART determinations in the 2008 AR RH SIP were disapproved. The FIP also required the installation of controls at units of an electric generating unit (EGU) that was not BART-eligible—Entergy Independence Units 1 and 2. Despite the previous disapproval of ADEQ's determination in the 2008 AR RH SIP that Georgia Pacific Crossett Mill Boiler 6A and 9A did not cause or contribute to visibility impairment in a Class I area, EPA reversed its decision and concurred with ADEQ that Georgia Pacific Crossett Mill Boiler 6A and 9A are not subject to BART.

On November 22, 2016, the State of Arkansas filed a Petition for Reconsideration and Administrative Stay of the AR RH FIP. In the petition, the State of Arkansas requested that EPA reconsider the AR RH FIP based on new information not raised during the comment period that is of central relevance to the outcome of the FIP. Arkansas asserted that EPA should reconsider controls on Entergy Independence in light of recent data from the IMPROVE monitoring network that shows that Arkansas has already achieved the amount of progress required for the 2008–2018 planning period without having implemented the controls required in the FIP. Arkansas requested that EPA reconsider NOx emission limitations placed on BART-eligible facilities in light of the recent rulemaking that increased the stringency of the CSAPR. Compliance with the previous, less stringent CSAPR rule was a legally sound alternative to source-by-source BART controls. Arkansas also requested reconsideration of the use of low-sulfur coal as BART for SO_2 at Entergy White Bluff. Arkansas requested an immediate administrative stay pending completion of EPA's reconsideration of the AR RH FIP.

On February 3, 2017, the State of Arkansas filed a Petition for Review of the AR RH FIP with the United States Court of Appeals for the Eighth Circuit. On March 8, 2017, the Court held the Petition for Review in abeyance for ninety days. On April 14, 2017, EPA issued a letter notifying Arkansas that the Agency was convening the reconsideration process for the following:

- Compliance dates for NOx emission limits for Flint Creek Unit 1, White Bluff Units 1 and 2, and Independence Units 1 and 2;
- Low-load NOx limits applicable to White Bluff Units 1 and 2 and Independence Units 1 and 2 during periods of operation at less than fifty percent of the unit's maximum heat input rating;

[8] *Promulgation of Air Quality Implementation Plans; State of Arkansas; Regional Haze and Interstate Visibility Transport Federal Implementation Plan; Final Rule* (81 FR 66332, September 27, 2016)

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- SO_2 emission limits for White Bluff Units 1 and 2; and
- Compliance dates for SO_2 emission limits for Independence Units 1 and 2.

On April 25, 2017, EPA published in the Federal Register a partial stay of the effectiveness of the AR RH FIP (82 FR 18994). Specifically, EPA stayed from April 25, 2017 until July 24, 2017 (ninety days) the compliance dates for the NOx emission limits at AECC Flint Creek Unit 1, White Bluff Units 1 and 2, and Independence Units 1 and 2, as well as the compliance dates for the SO_2 emission limits for White Bluff units 1 and 2 and Independence Units 1 and 2. This action did not alter or extend the ultimate compliance dates for these units nor did it stay requirements for other units subject to the FIP.

III. BART Requirements for NOx for Subject-to-BART Units Participating in the CSAPR Program

Arkansas meets all current requirements under 40 C.F.R. § 51.308(e)(4), which states the following:

> A State subject to a trading program established in accordance with § 52.38 or § 52.39 under a Transport Rule Federal Implementation Plan need not require BART–eligible fossil fuel-fired steam electric plants in the State to install, operate, and maintain BART for the pollutant covered by such trading program in the State.

Arkansas is currently subject to a trading program established in accordance with 40 C.F.R. § 52.38 under a Transport Rule Federal Implementation Plan for NOx during the ozone season. As a result, Arkansas need not require BART-eligible fossil fuel-fired steam electric plant units participating in the CSAPR program in the State to install, operate, and maintain BART for NOx.

On June 7, 2012, EPA published a final rule (77 FR 33642) allowing states participating in the CSAPR trading program, which is also known as the Transport Rule (76 FR 48208) to use CSAPR to satisfy BART, including states participating only for ozone season NOx. Reliance on the CSAPR trading program as better than source-specific BART has repeatedly withstood legal scrutiny.[9]

Since promulgating the use of CSAPR as an alternative that achieves greater visibility

[9] *e.g. Nat'l Parks Conservation Ass'n v. McCarthy*, 816 F.3d 989, 995 (8th Cir. 2016)
(The Eighth Circuit upheld EPA's approval of CSAPR as better than BART for units in Minnesota's SIP).

improvements than source-specific BART, EPA has promulgated an update to the CSAPR program with more stringent budgets (81 FR 74504). Revisions to the program as a result of this update are codified at 40 C.F.R. § 52.318. The CSAPR Update revised the ozone season NOx budget for Arkansas units from 15,110 tons in 2015 to 12,048 tons (10,132 allocated to existing EGUs) in 2017 with a further reduction to 9,210 (7,781 allocated to existing EGUs) in 2018 and beyond.

CSAPR has been subject to extensive litigation since the program was initially established in 2011. In 2012, CSAPR was vacated and remanded to EPA by the D.C. Circuit Court.[10] In 2014, the U.S. Supreme Court reversed the D.C. Circuit opinion and the D.C. Circuit Court lifted the stay of CSAPR.[11] On July 18, 2015, the D.C. Circuit generally upheld CSAPR, but remanded without vacating the CSAPR Phase 2 emissions budgets for some states.[12] Arkansas was not included among the states for which budgets were remanded. Due to this partial remand of budgets, EPA proposed a sensitivity analysis showing that EPA's 2012 demonstration that CSAPR qualifies as a BART alternative would not be adversely affected by modifying the assumptions to reflect the actions that have been or are expected to be taken in response to the D.C. Circuit's remand of CSAPR Phase 2 budgets.[13]

The 2018 Arkansas ozone season NOx emission budgets under the CSAPR update achieve a greater reduction in NOx emissions than do implementation of NOx BART controls included the AR RH FIP.[14] The 2018 CSAPR trading program ozone season allocations for Arkansas EGUs add up to 3,708 tons less than 2016 Arkansas EGU ozone season emissions. The NOx BART controls included in the AR RH FIP are estimated to achieve a 240 ton reduction in NOx emissions from 2016 Arkansas EGU annual emissions. ADEQ also anticipates that some EGUs will choose to install combustion controls to comply with CSAPR that would reduce emissions year-round, not just in the ozone season. Therefore, ADEQ anticipates that the total annual NOx reduction associated with compliance with the 2018 CSAPR ozone season trading program would be greater than 3,708 tons.

ADEQ has determined that it is appropriate under 40 C.F.R § 51.308 and provides additional flexibility for CSAPR participating subject-to-BART units in Arkansas to rely upon participation in the CSAPR ozone season NOx trading program rather than source-specific BART requirements for NOx. Participation in CSAPR for ozone season NOx is federally enforceable

[10] *EME Homer City Generation, L.P. v. EPA* (No. 12-1182)
[11] *EPA. V. EME Homer City Generation, L. P.* 572 U.S. __ (2014)
[12] *EME Homer City Generation, L.P. v. EPA* (No. 12-1182, Document #1564814)
[13] 81 FR 78954
[14] A spreadsheet comparing 2016 Air Markets Program Data Ozone Season NOx emissions to Arkansas EGU 2017 and 2018 CSAPR NOx allocations and comparing 2016 Air Markets Program Data Annual NOx emissions to controlled emissions estimates included in the AR RH FIP can be found in Appendix A.

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under 40 C.F.R. 52.38 and the ozone season NOx requirements under CSAPR apply to the following BART-eligible units:

- Arkansas Electric Cooperative Corporation (AECC) Bailey Plant Unit 1;
- AECC McClellan Plant Unit 1;
- American Electric Power (AEP)/Southwest Power Company (SWEPCO) Flint Creek Plant Boiler No. 1;
- Entergy Arkansas, Inc. (Entergy) Lake Catherine Plant Unit 4;
- Entergy White Bluff Units 1 and 2 and Auxiliary Boiler;

As of the effective date of EPA's final approval of this SIP revision, compliance with the CSAPR trading program for ozone season NOx as set forth in 40 C.F.R. 52.38 shall supersede NOx emission limits for the units listed above previously adopted into Arkansas Pollution Control and Ecology Commission Regulation No. 19 Chapter 15.

IV. Reasonable Progress

The 1999 RHR requires states to establish reasonable progress goals RPGs for each Class I area within the state. These goals must ensure reasonable progress consistent with the URP necessary to achieve natural visibility conditions by 2064 on the twenty percent worst days and no degradation on the twenty percent best days. In establishing RPGs, the RHR requires states to consider four factors: (1) cost of compliance, (2) the time necessary for compliance, (3) the energy and non-air quality environmental impacts of compliance, and (4) the remaining useful life of potentially affected sources. If a state determines that additional progress beyond what is necessary to achieve the URP is reasonable, the RHR rule states that "the State should adopt that amount of progress as its goal for the first-long-term strategy." The RHR rules also require states to provide a demonstration as part of the SIP if the State determines that the URP needed to reach natural conditions is not reasonable.

In the 2008 AR RH SIP, ADEQ established a URP for Caney Creek and Upper Buffalo wilderness areas based on the progress needed to reach natural conditions by 2064 in each area. The 2008 AR RH SIP established RPGs based on a combination of already mandated controls, including BART requirements, and demonstrated that these measures would provide for a rate of progress that improves visibility conditions on the worst days at a rate that surpasses the URP and prevents degradation on the best days. ADEQ reasoned that no four factor analysis was required because the State determined that no additional controls were necessary to ensure reasonable progress toward natural visibility by 2064 beyond those controls required for sources subject to BART requirements. Therefore, the 2008 AR RH SIP did not include a four factor analysis.

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In 2012, EPA issued a partial approval and a partial disapproval of the 2008 AR RH SIP. In this action, EPA approved the URP, but disapproved the RPGs. In justifying its disapproval of Arkansas's RPGs, EPA asserted that the URP does not establish a "safe harbor" for the State in setting its RPGs and that Arkansas should have performed a four factor analysis and determined whether additional progress would be reasonable.[15] This submittal addresses EPA's disapproval of the reasonable progress analysis included in the 2008 AR RH SIP by considering key pollutants that contribute to visibility impairment in Arkansas Class I areas and using the four factors to assess whether NOx controls on sources that are not subject to BART are reasonable.

A. Identification of Key Pollutants and Source Categories That Contribute to Visibility Impairment in Arkansas Class I Areas

Included with the 2008 AR RH SIP, ADEQ provided emissions and air quality modeling performed by Central Regional Air Planning Association (CENRAP) in support of SIP development in the central states region.[16] As part of this modeling, the Particulate Source Apportionment Technology Tool (PSAT), included with CAMx Version 4.4, was used to provide source apportionment by geographic regions and major source categories for pollutants that contribute to visibility impairment at each of the Class I areas in the central states region.[17] The PSAT results demonstrate that sulfate (SO_4) from point sources is the principle driver of visibility extinction at both Arkansas Class I areas on the twenty percent worst days.

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1. Regional Particulate Source Apportionment for Caney Creek and Upper Buffalo Wilderness Areas

Table 1 shows the modeled relative contributions to light extinction for each source category at Caney Creek and Upper Buffalo wilderness areas on the twenty-percent worst days in 2002. Point sources, responsible for approximately sixty percent of total light extinction at each Arkansas Class I area, are the primary contributor to visibility extinction on the twenty percent worst days. Area sources are the next largest contributor to light extinction at Arkansas Class I areas; however, area sources only contribute thirteen percent and sixteen percent of total light extinction at Caney Creek and Upper Buffalo wilderness areas, respectively. The other source categories each contribute between two percent and six percent of total light extinction at Arkansas Class I areas.

Table 1 Modeled Light Extinction for the 20% Worst Days at Caney Creek and Upper Buffalo Wilderness Areas in 2002 (Mm^{-1})

[15] Approval and Promulgation of Implementation Plans; Arkansas Regional Haze State Implementation Plan; Interstate Transport State Implementation Plan to Address Pollution Affecting Visibility and Regional Haze: Proposed Rule (76 FR 64195)

[16] The central states region includes Texas, Oklahoma, Louisiana, Arkansas, Kansas, Missouri, Nebraska, Iowa, Minnesota; and tribal governments included in these states.

[17] August 27, 2007 CENRAP PSAT tool: W20% Projected Bext;

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	Point	Natural	On-Road	Non-Road	Area
Caney Creek	81.04	2.45	7.26	7.31	17.81
Upper Buffalo	77.8	2.39	6.62	7.72	20.46

Figure 2 and Figure 3 show the modeled relative contributions to light extinction for each species and source category at Caney Creek and Upper Buffalo wilderness areas on the twenty percent worst days in 2002. According to the 2002 PSAT results, sulfates (SO_4) contributed approximately sixty-five percent and sixty-three percent of modeled visibility extinction at Caney Creek and Upper Buffalo wilderness areas, respectively, on the twenty percent worst days in 2002. The point source category contributed eighty-six percent and eighty-seven percent of light extinction due to SO_4 at Caney Creek and Upper Buffalo, respectively, on the twenty percent worst days. The other source categories contribute much smaller proportions of light extinction due to SO_4. In fact, point sources of SO_4 contributed fifty-five to fifty-six percent of total light extinction at Arkansas Class I areas. By contrast, nitrate (NO_3) contributed approximately ten percent, primary organic aerosols (POA) contributed approximately eight percent, elemental carbon (EC) contributed approximately four percent, and soil contributed approximately one percent of modeled visibility extinction at both wilderness areas in 2002 on the twenty worst days. Crustal material (CM) contributed approximately three percent and five percent of modeled visibility extinction at Caney Creek and Upper Buffalo wilderness areas, respectively, on the twenty percent worst days. Relative contributions from on-road and point sources each represent approximately a third of light extinction attributed to NO_3. Area sources were the primary driver of light extinction attributed to POA, soil, and CM. Light extinction attributed to EC is primarily driven by non-road and area sources.

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Figure 2 Modeled Light Extinction for the 20% Worst Days at Caney Creek Wilderness Area in 2002

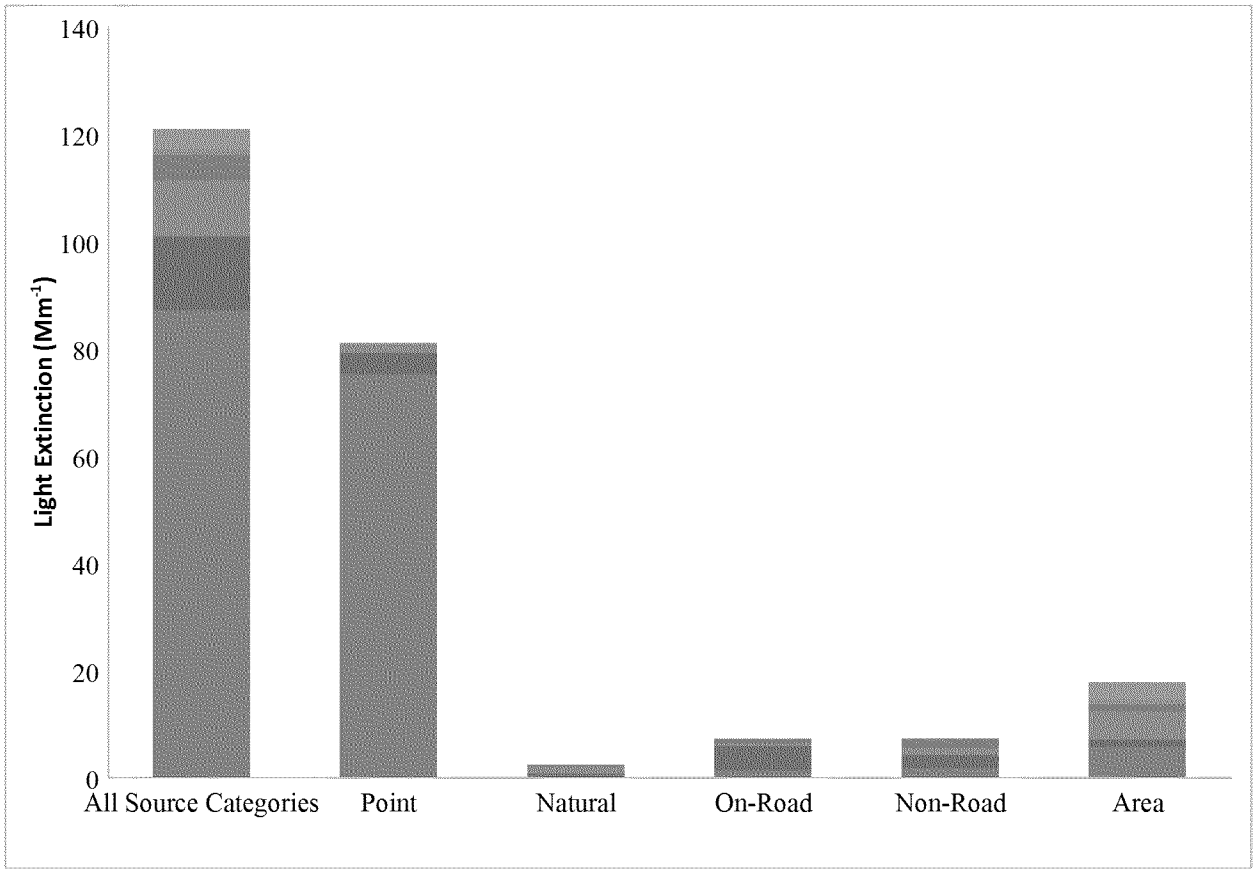

Figure 3 Modeled Light Extinction for the 20% Worst Days at Upper Buffalo Wilderness Area in 2002

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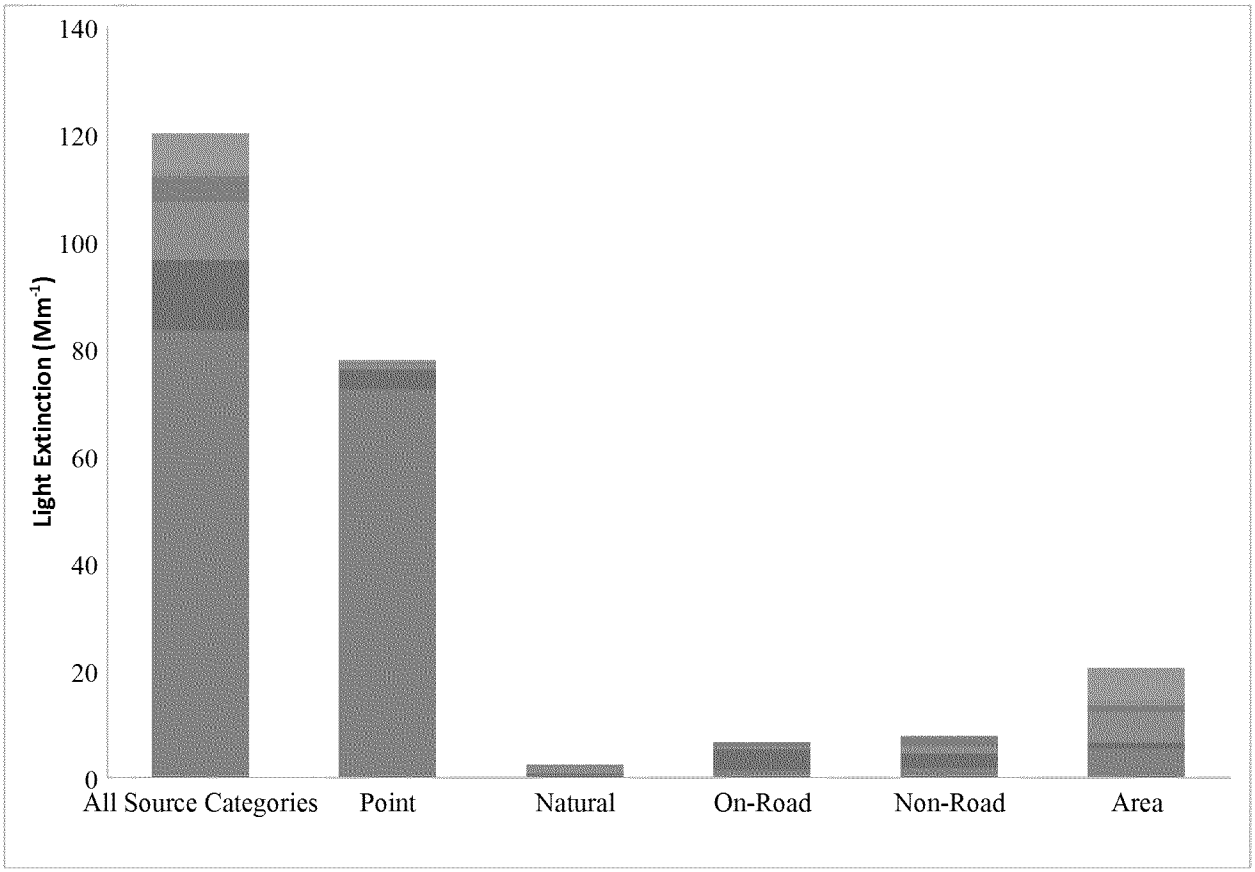

Table 2 shows the modeled relative contributions to light extinction for each source category at Caney Creek and Upper Buffalo wilderness areas, respectively, on the twenty percent worst days in 2018. Point sources are projected to remain the primary contributor to light extinction at Arkansas Class I areas. Point sources are projected to contribute approximately fifty-three percent of total light extinction at Caney Creek and fifty percent of total light extinction at Upper Buffalo on the twenty percent worst days in 2018. Area sources are also projected to continue to be the second largest contributor to light extinction with contributions of twenty percent of total light extinction at Caney Creek and twenty-three percent of total light extinction at Upper Buffalo on the twenty percent worst days in 2018. Natural, on-road, and non-road sources are projected to continue to contribute a very small portion of total light extinction at Arkansas Class I areas on the twenty percent worst days in 2018.

Table 2 Modeled Light Extinction for the 20% Worst Days at Caney Creek Upper Buffalo Wilderness Areas in 2018 (Mm^{-1})

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	Point	Natural	On-Road	Non-Road	Area
Caney Creek	45.27	2.12	1.44	3.76	16.96
Upper Buffalo	43.02	2.24	1.57	4.25	19.71

Figure 4 and Figure 5 show the modeled relative contributions to light extinction for each species and source category at Caney Creek and Upper Buffalo wilderness areas on the twenty percent worst days in 2018. According to the regional PSAT data, light extinction attributed to SO_4 is projected to decrease on the twenty percent worst days by forty-four percent at Caney Creek and by forty-five percent at Upper Buffalo between 2002 and 2018; however, SO_4 is projected to continue to be the primary driver of total light extinction. The 2018 projections show that point sources will continue to be the primary source of light extinction due to SO_4. Point sources of SO_4 are projected to contribute forty-three to forty-six percent of total light extinction on the twenty percent worst days in 2018 in Arkansas Class I areas. The other species are also projected to see reductions in their contribution to total light extinction; however, their relative contributions to total light extinction during 2018 remain much smaller than that of SO_4. Light extinction on the twenty percent worst days attributed to NO_3 from on-road sources is projected to decrease more rapidly than light extinction attributed to NO_3 from point sources; however, point sources of NO_3 will only contribute three to four percent of total light extinction at Arkansas Class I areas on the twenty percent worst days based on 2018 projections.

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Figure 4 Modeled Light Extinction for the 20% Worst Days at Caney Creek Wilderness Area in 2018 (Mm^{-1})

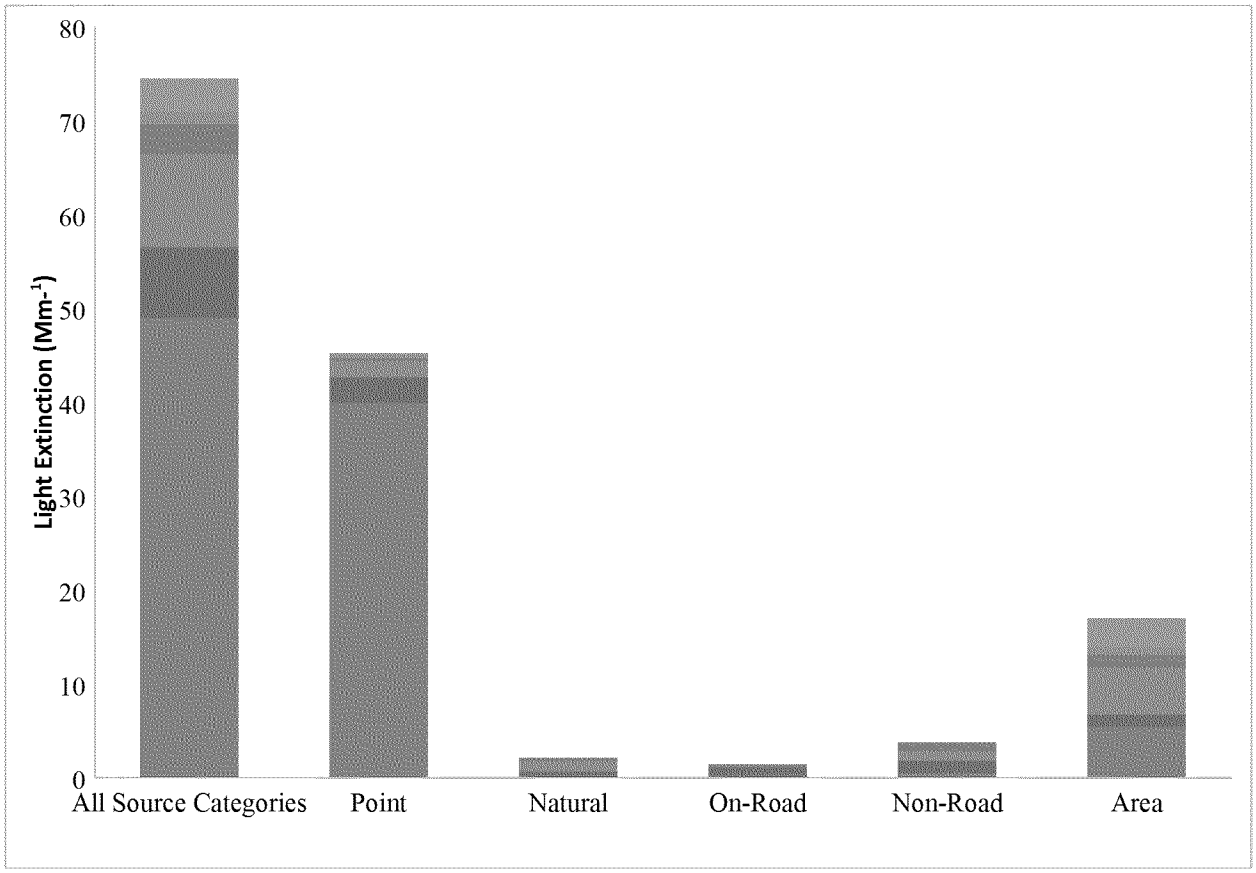

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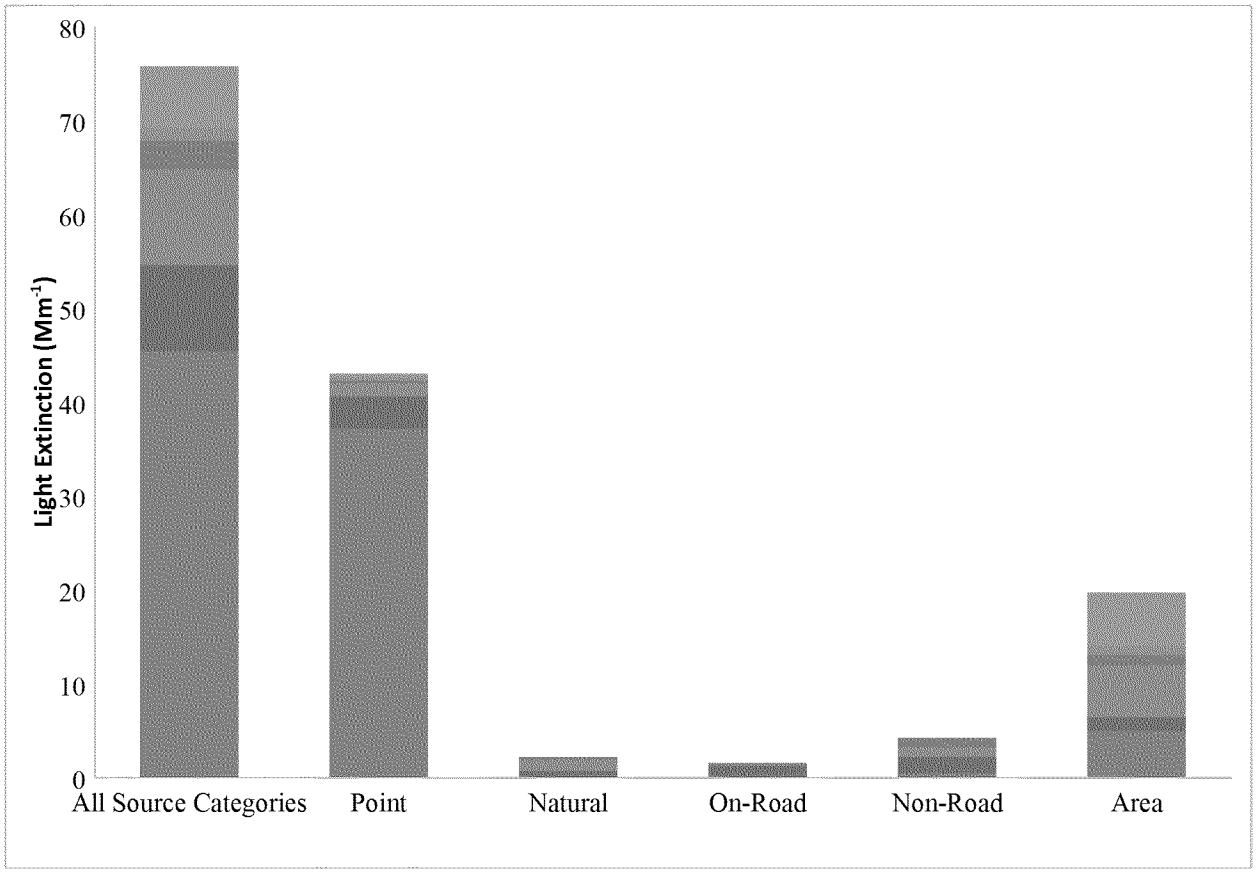
Figure 5 Modeled Light Extinction for the 20% Worst Days at Upper Buffalo Wilderness Area in 2018 (Mm^{-1})



2. Arkansas Particulate Source Apportionment for Caney Creek and Upper Buffalo Wilderness Areas

The relative contribution of sources within Arkansas to total light extinction on the twenty percent worst days at both Arkansas Class I areas is small. Species attributed to Arkansas sources contributed approximately ten percent of total light extinction on the twenty percent worst days in Arkansas Class I areas according to 2002 data and are projected to contribute between thirteen and fourteen percent of total light extinction on the twenty percent worst days in Arkansas Class I areas in 2018. Total light extinction is projected to decrease by thirty-five percent on the twenty percent worst days at Arkansas Class I areas between 2002 and 2018. Light extinction on the twenty percent worst days attributed to species from Arkansas sources is projected to decrease by seventeen percent at Caney Creek and to decrease by eleven percent at Upper Buffalo between 2002 and 2018.

Table 3 shows the relative contributions of sources within Arkansas to light extinction for each source category at Caney Creek and Upper Buffalo wilderness areas, respectively, on the twenty

percent worst days in 2002. Area sources had a larger impact on visibility extinction than did point sources when only sources within Arkansas were considered. On the twenty percent worst days in 2002, area sources contributed approximately thirty-seven percent of light extinction attributed to Arkansas sources (four percent of total light extinction) at Caney Creek and fifty percent of light extinction attributed to Arkansas sources (five percent of total light extinction) at Upper Buffalo. Point sources contributed approximately twenty-eight percent of light extinction attributed to Arkansas sources (three percent of total light extinction) at Caney Creek and twenty-four percent of light extinction attributed to Arkansas sources (two percent of total light extinction) at Upper Buffalo on the twenty percent worst days. The other sources in Arkansas contributed between seven and fourteen percent each to light extinction attributed to Arkansas sources (approximately one percent each to total light extinction) at Arkansas Class I areas on the twenty percent worst days in 2002.

Table 3 Modeled Light Extinction due to Arkansas Sources for the 20% Worst Days at Caney Creek and Upper Buffalo Wilderness Areas in 2002 (Mm^{-1})

	Point	Natural	On-Road	Non-Road	Area
Caney Creek	3.85	1.1	1.88	1.72	5.03
Upper Buffalo	3.25	0.94	1.29	1.26	6.72

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Figure 6 and Figure 7 show the relative contributions of sources within Arkansas to light extinction for each source category and species at Caney Creek and Upper Buffalo wilderness areas, respectively, on the twenty percent worst days in 2002. SO4 from Arkansas sources contributed approximately three percent of total modeled visibility extinction at Caney Creek and Upper Buffalo wilderness areas in 2002 on the twenty percent worst days. The point source category contributed approximately two thirds of the light extinction attributed to SO4 from Arkansas sources at Caney Creek and Upper Buffalo wilderness areas, respectively, on the twenty percent worst days in 2002. POA from Arkansas sources contributed approximately three percent and two percent of total light extinction on the twenty percent worst days at Caney Creek and Upper Buffalo wilderness areas, respectively. Area sources were the primary driver of light extinction due to POA. NO3 from Arkansas sources contributed approximately two percent and one percent to light extinction at Caney Creek and Upper Buffalo wilderness areas on the twenty percent worst days, respectively. On-road sources accounted for approximately fifty percent of the light extinction at Arkansas Class I areas attributed to Arkansas NO3 sources. EC from Arkansas sources contributed approximately one percent and soil from Arkansas sources contributed approximately 0.2% to total light extinction at both Arkansas Class I areas on the twenty percent worst days. Attribution to light extinction from Arkansas sources of EC was split primarily between on-road, non-road, and area sources. Light extinction from Arkansas sources of soil was primarily attributed to area sources. CM from Arkansas sources, primarily area sources, contributed approximately one and two percent of total light extinction and Caney Creek and Upper Buffalo wilderness areas, respectively.

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Figure 6 Modeled Light Extinction due to Arkansas Sources for the 20% Worst Days at Caney Creek Wilderness Area in 2002 (Mm^{-1})

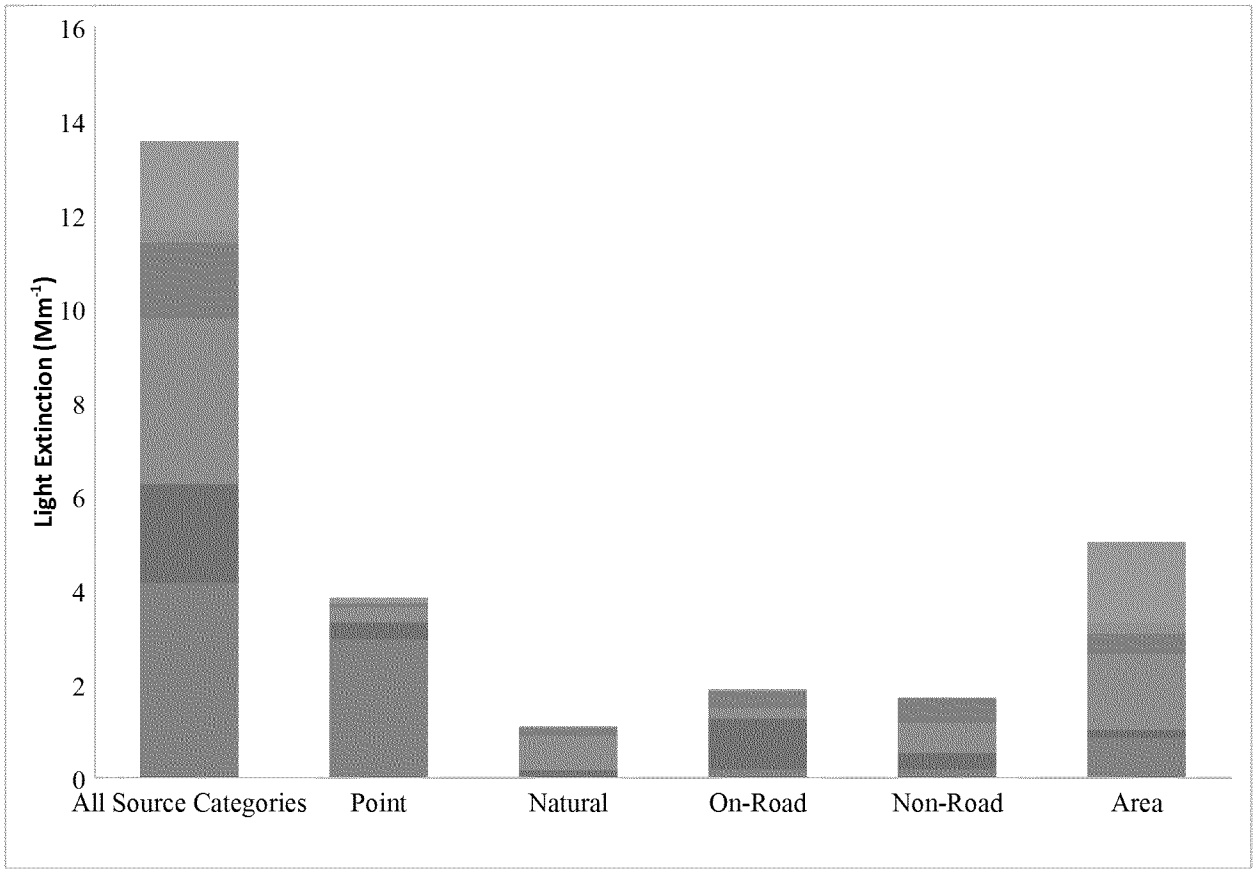

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Figure 7 Modeled Light Extinction due to Arkansas Sources for the 20% Worst Days at Upper Buffalo Wilderness Area in 2002 (Mm^{-1})

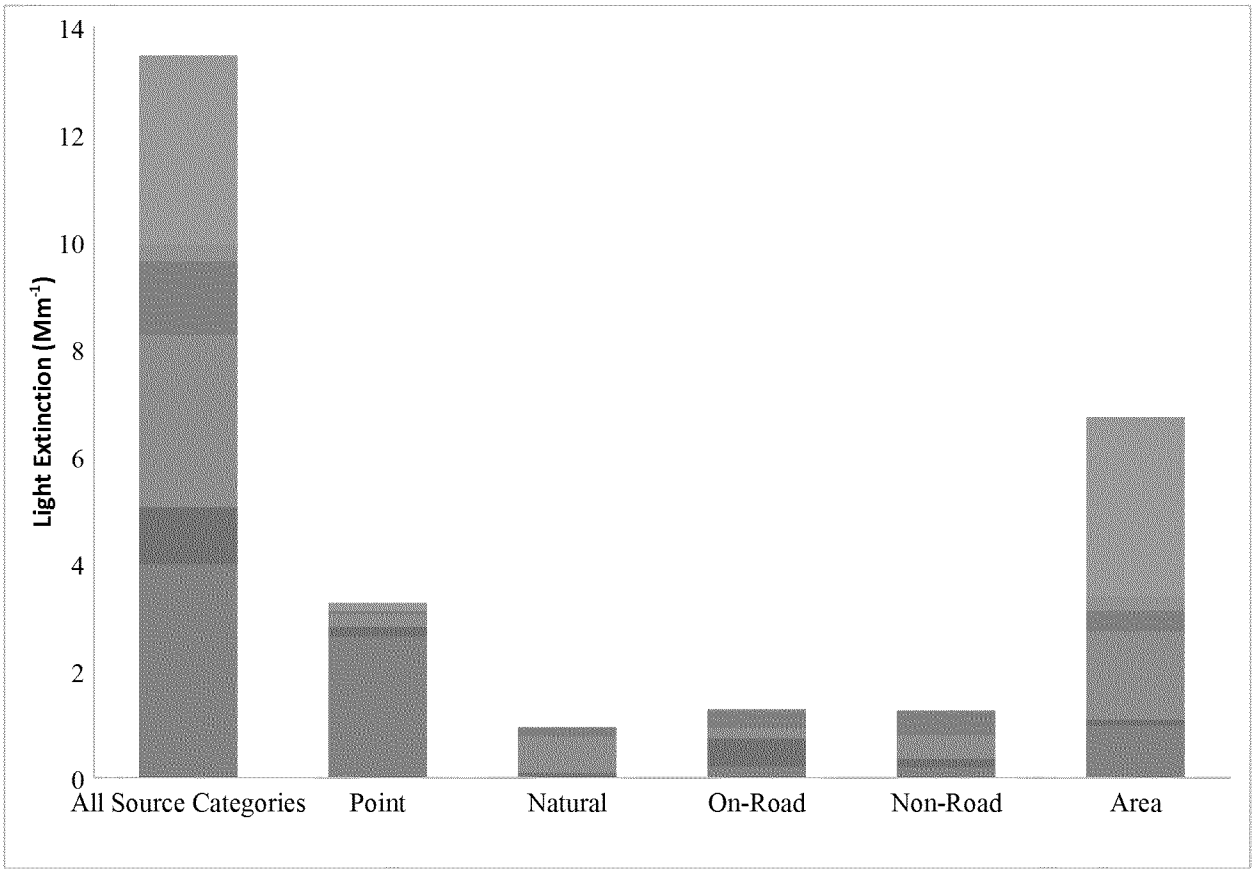

Table 4 shows the relative contributions of sources within Arkansas to light extinction for each source category at Caney Creek and Upper Buffalo wilderness areas, respectively, on the twenty percent worst days in 2018. Area sources are projected to continue to have a larger impact on visibility extinction than do point sources when only sources located in Arkansas are considered. Area sources are projected to contribute approximately forty-three percent of light extinction attributed to Arkansas sources (six percent of total light extinction) at Caney Creek and fifty-four percent of light extinction attributed to Arkansas sources (eight percent) of total light extinction) at Upper Buffalo. Point sources are projected to contribute approximately thirty-six percent of light extinction attributed to Arkansas sources (five percent of total light extinction) at Caney Creek and thirty percent of light extinction attributed to Arkansas sources (four percent of total light extinction) at Upper Buffalo. The other sources in Arkansas are projected to contribute between two percent and nine percent each to light extinction from Arkansas sources (0.3–1.2% of total light extinction) at Arkansas Class I areas on the twenty percent worst days in 2018.

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Table 4 Modeled Light Extinction due to Arkansas Sources for the 20% Worst Days at Caney Creek and Upper Buffalo Wilderness Areas in 2018 (Mm^{-1})

	Point	Natural	On-Road	Non-Road	Area
Caney Creek	4.05	1.04	0.35	0.95	4.85
Upper Buffalo	3.63	0.91	0.3	0.66	6.52

Figure 8 and Figure 9 show the relative contributions of sources within Arkansas to light extinction for each species and source category at Caney Creek and Upper Buffalo wilderness areas, respectively, on the twenty percent worst days in 2018. According to the PSAT data for Arkansas sources, light extinction attributed to Arkansas NO_3 sources is projected to decrease by sixty-two percent at Caney Creek and by forty-one percent at Upper Buffalo. This projected decrease is largely due to a decrease in light extinction attributed to NO_3 from Arkansas on-road sources. Overall light extinction attributed to Arkansas sources of SO_4 are projected to decrease at Arkansas Class I areas; however, light extinction attributed to point sources of SO_4 located in Arkansas is projected to increase by four percent at Caney Creek and five percent at Upper Buffalo on the twenty percent worst days. Nevertheless, the contribution to total light extinction of SO_4 from Arkansas point sources remains relatively small—three percent of total light extinction at each Arkansas Class I area. Light extinction due to Arkansas sources of POA, EC, and CM are also projected to decrease. Light extinction due to Arkansas sources of soil is projected to increase; but, soil will remain the smallest Arkansas contributor to light extinction at both Arkansas Class I areas.

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Figure 8 Modeled Light Extinction due to Arkansas Sources for the 20% Worst Days at Caney Creek Wilderness Area in 2018

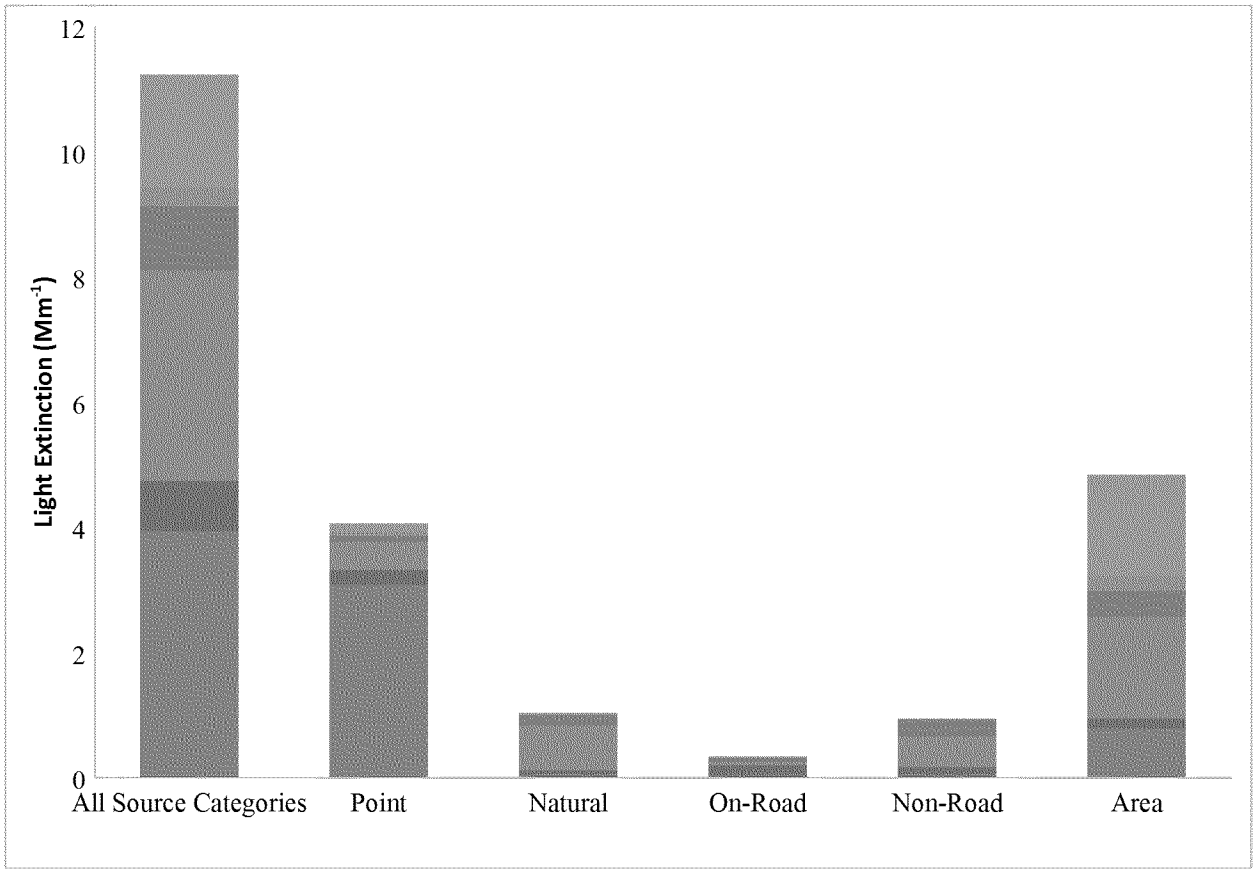

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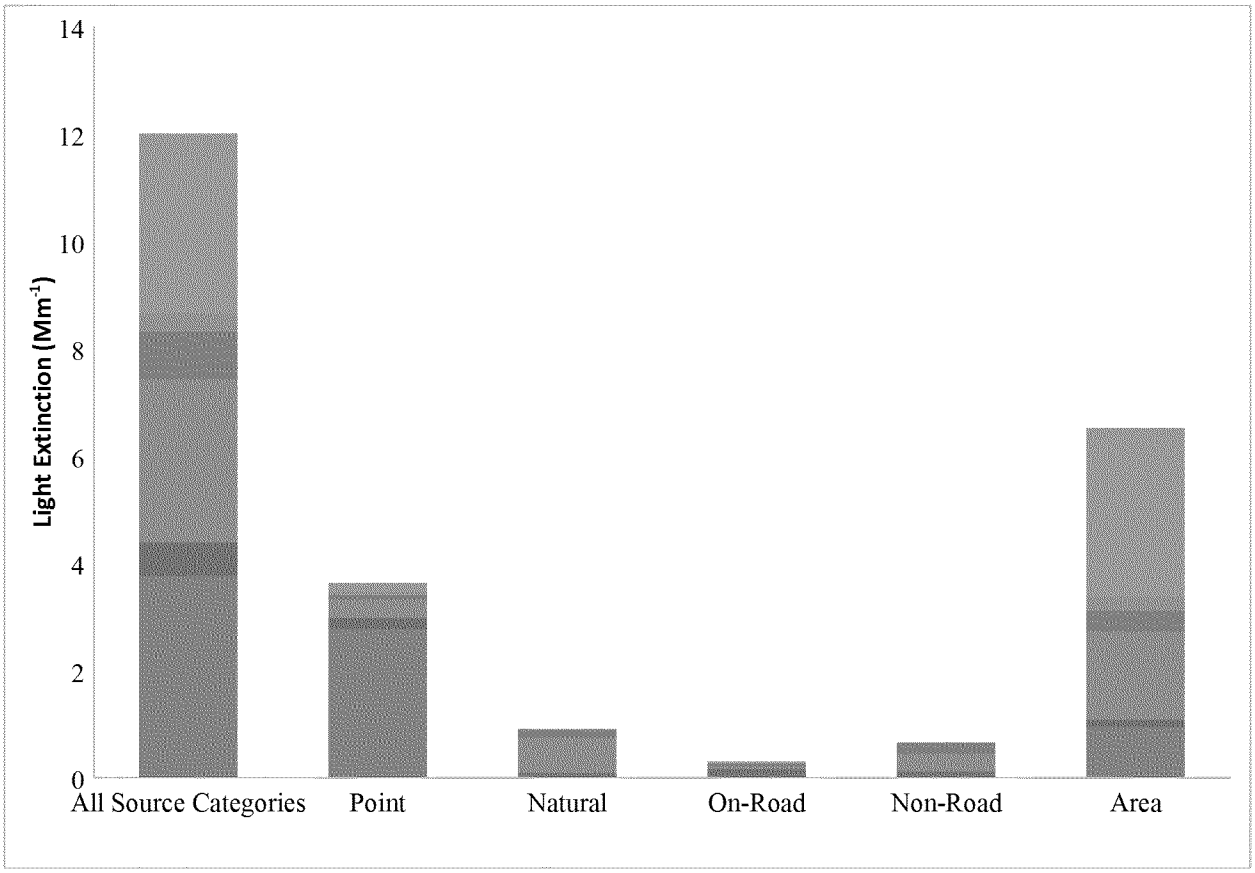
Figure 9 Modeled Light Extinction due to Arkansas Sources for the 20% Worst Days at Upper Buffalo Wilderness Area in 2018



3. Summary of Key Pollutant and Source Category Findings

The region-wide PSAT data indicate that the relative contribution of SO_4 to light extinction at Arkansas Class I areas is much higher than for other pollutants on the twenty percent worst days. The majority of light extinction due to SO_4 can be attributed to point sources. The PSAT results for Arkansas sources illustrate that the relative contribution to light extinction of the various species from Arkansas sources is not as weighted toward SO_4 as the regional data set showed. Approximately a quarter of light extinction at Arkansas Class I areas resulting from sources located in Arkansas can be attributed to point sources of SO_4. Light extinction from all species associated with the point source category is smaller than for area sources when only sources located in Arkansas are considered. POA and CM are the primary species associated with area source contributions to light extinction.

After examining both region-wide PSAT data and data for Arkansas sources, ADEQ has identified SO_4 as the key species contributing to light extinction at Caney Creek and Upper Buffalo wilderness areas. Area sources do contribute a larger proportion of total light extinction

when only sources located in Arkansas are considered; however, the cost-effectiveness for control of POA and CM species from many individual small sources is difficult to quantify. Only a very small proportion of total light extinction is due to NO_3 from Arkansas sources and this proportion has historically been driven by onroad sources, which are regulated by national vehicle emission standards. NO_3 from Arkansas point sources contributed less than half a percent of total light extinction on the twenty percent worst days at Caney Creek and Upper Buffalo based on 2002 PSAT data and is projected to contribute even less in 2018. Attribution of light extinction to soil and EC for Caney Creek and Upper Buffalo remain in both regional and Arkansas data sets. The primary driver of SO_4 formation is emissions of SO_2 from point sources both region-wide and in Arkansas. As such, ADEQ will evaluate in a subsequent SIP large sources of SO_2 to determine whether their emissions and proximity to Arkansas Class I areas warrant further analysis using the four statutory factors.

B. Consideration of NOx Controls for Reasonable Progress

Because visibility impairment due to NO_3 from Arkansas point sources is miniscule, ADEQ anticipates that additional controls of NOx emissions from point sources in the State would not yield meaningful visibility improvements at Arkansas Class I areas. Furthermore, Arkansas EGUs that have a nameplate capacity of 25 MW or greater participate in the CSAPR ozone season NOx emissions trading program. In addition to those subject-to-BART units identified in Section III of this SIP, the following EGUs in Arkansas are required to participate in CSAPR for ozone season NOx:

- City Water & Light – City of Jonesboro;
- Associated Electric Cooperative, Inc. Dell Power Plant;
- AECC Fulton Generating Station;
- AEP/SWEPCO Harry D. Mattison Power Plant;
- Entergy Harvey Couch;
- Entergy Hot Spring Generating Facility;
- AECC Magnet Cove;
- Entergy Independence;
- John W. Turk Jr. Power Plant;
- AECC Oswald Generating Station;
- Evergreen Packaging Pine Bluff Energy Center;
- Plum Point Energy Station;
- Entergy Robert E Ritchie;
- AECC Thomas Fitzhugh; and
- Entergy Union Power Station.

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In the AR RH FIP, EPA required one of these facilities, Entergy Independence, to install low NOx burners despite the negligible impact NO_3 from Arkansas sources has on visibility impacts in Arkansas Class I areas. This SIP revision replaces NOx control requirements included in the AR RH FIP for Independence with reliance upon the CSAPR trading program for ozone season NOx for all Arkansas EGUs participating in the CSAPR program. The 2018 CSAPR trading program ozone season allocations for Arkansas EGUs add up to 3,708 tons less than 2016 Arkansas EGU ozone season emissions.[18] The NOx controls included in the AR RH FIP are estimated to achieve a 3,318 ton reduction in NOx emissions from 2016 Arkansas EGU annual emissions. ADEQ also anticipates that some EGUs will choose to install combustion controls to comply with CSAPR that would reduce emissions year-round, not just in the ozone season. Therefore, ADEQ anticipates that the total annual NOx reduction associated with compliance with the 2018 CSAPR ozone season trading program would be greater than 3,708 tons.

V. Review, Consultations, and Comments

A. EPA Review with Parallel Processing

The State of Arkansas plans to submit this proposed SIP revision, along with a request for parallel processing and a draft notice of public hearing and opportunity for comment, to EPA. Arkansas also requested that EPA stay the NOx emission limits for EGUs contained in the AR RH FIP during EPA's review of this SIP revision and withdraw such limits upon approval of this SIP revision. The request for parallel processing has been included in Tab A of this proposed SIP package.

B. Federal Land Manager Consultation

In accordance with the provisions of 40 C.F.R. § 51.308(i)(2), ADEQ will consult with the designated FLM staff personnel. This consultation will give FLMs the opportunity to discuss their assessment of the impact of the proposed SIP revisions on Arkansas Class I areas——Upper Buffalo Wilderness Area and Caney Creek—and other Class I areas.

ADEQ will submit letters to notify the federal land manager staff of this proposed SIP revision and to provide them with electronic access to the revision and related documents. Any comments received from the FLMs will be considered and posted to ADEQ's Regional Haze webpage: https://www.adeq.state.ar.us/air/planning/sip/regional-haze.aspx. The FLM contact list and notification letters are included in Tab E of this proposed SIP package. Comments from FLMs and responses will be included in the final SIP package

[18] A spreadsheet comparing 2016 Air Markets Program Data Ozone Season NOx emissions to Arkansas EGU 2017 and 2018 CSAPR NOx allocations and comparing 2016 Air Markets Program Data Annual NOx emissions to controlled emissions estimates included in the AR RH FIP can be found in Appendix A.

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C. Consultation with States

For the 2008 AR RH SIP, ADEQ engaged in extensive interstate consultation with states participating in the CENRAP RPO. Because Missouri has two Class I areas impacted by Arkansas sources, ADEQ will submit a letter to Missouri Department of Natural Resources (DNR) air pollution control program staff to notify them of this proposed SIP revision and to provide them with electronic access to the revision and related documents. Any comments received from Missouri DNR will be considered and posted to ADEQ's Regional Haze webpage. The notification letter is included in Tab E of this proposed SIP package. Comments from Missouri DNR and responses will be included in the final SIP package.

D. Public Review

ADEQ will provide notice of a public hearing to receive public comments on this proposed SIP revision. The notice of the proposal and public hearing will be published in the Arkansas Democrat Gazette, which is a newspaper in circulation statewide, at least thirty days prior to the public hearing and will be posted on ADEQ's website concurrently with newspaper publication of the public notice. The notice will provide logistical information regarding the public hearing and the length of the public comment period. The public comment period for this SIP revision will be at least thirty days in accordance with notice requirements under 40 C.F.R. §51.102.

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The notice contains information on the availability of the proposed SIP revision for public inspection at ADEQ information depositories, ADEQ headquarters, and ADEQ's Regional Haze webpage.

Both oral and written comments received by ADEQ during the public comment period will be posted on the ADEQ Regional Haze web page. Copies of written comments, a summary of ADEQ's response to comments, and records from the public hearing will be included in the final SIP package.

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Appendix A Cross-State Air Pollution Rule Emission Reductions versus Federal Implementation Plan Nitrogen Oxides Reductions

Plant Name	Boiler ID	CSAPR NOx Allocation 2017 (Ozone Season)	CSAPR NOx Allocation 2018 and Beyond (Ozone Season)	AMPD 2016 Emissions (Ozone Season)	Δ 2016 emissions and 2017 budget (Ozone Season)	Δ 2016 emissions and 2018 budget (Ozone Season)	FIP Controlled Emissions (Annual)	AMPD 2016 emissions (Annual)	Δ FIP controlled emissions compared to 2016 emissions (Annual)
Carl Bailey	01	36	26	12.026	24	14			
Cecil Lynch	2				0	0			
Cecil Lynch	3	118	86		118	86			
City Water & Light - City of Jonesboro	SN04	20	14	6.729	13	7			
City Water & Light - City of Jonesboro	SN06	24	17	1.214	23	16			
City Water & Light - City of Jonesboro	SN07	19	15	12.104	7	3			
Dell Power Plant	1	17	17	11.431	6	6			
Dell Power Plant	2	18	18	9.936	8	8			
Flint Creek Power Plant	1	1,332	965	1622.15	-290	-657	4294.65	3055.824	1238.826
Fulton	CT1	14	14	9.02	5	5			
Hamilton Moses	1				0	0			
Hamilton Moses	2				0	0			
Harry D. Mattison Power Plant	1	21	21	14.653	6	6			

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Harry D. Mattison Power Plant	2	19	18	16.112	3	2			
Harry D. Mattison Power Plant	3	12	12	10.538	1	1			
Harry D. Mattison Power Plant	4	9	9	8.81	0	0			
Harvey Couch	1				0	0			
Harvey Couch	2	17	12		17	12			
Hot Spring Energy Facility	CT-1	28	28	22.032	6	6			
Hot Spring Energy Facility	CT-2	21	21	21.634	-1	-1			
Hot Spring Power Co., LLC	SN-01	37	37	18.613	18	18			
Hot Spring Power Co., LLC	SN-02	38	38	18.411	20	20			
Independence	1	1,840	1,333	2686.47	-846	-1,353	3619	4953.654	-1334.654
Independence	2	2,017	1,461	2527.818	-511	-1,067	3167	4910.009	-1743.009
John W. Turk Jr. Power Plant	SN-01	322	322	287.314	35	35			
Lake Catherine	1	0	0		0	0			
Lake Catherine	2	0	0		0	0			
Lake Catherine	3	1	1		1	1			
Lake Catherine	4	256	186	369.483	-113	-183	564	528.934	35.066
McClellan	01	108	78	77.42	31	1			
Oswald Generating Station	G1	26	22	24.129	2	-2			
Oswald Generating Station	G2	19	19	20.613	-2	-2			

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Oswald Generating Station	G3	24	21	15.797	8	5			
Oswald Generating Station	G4	14	14	22.192	-8	-8			
Oswald Generating Station	G5	19	17	19.746	-1	-3			
Oswald Generating Station	G6	18	16	22.066	-4	-6			
Oswald Generating Station	G7	18	18	48.212	-30	-30			
Pine Bluff Energy Center	CT-1	108	108	88.273	20	20			
Plum Point Energy Station	1	690	690	612.705	77	77			
Robert E Ritchie	2				0	0			
Thomas Fitzhugh	2	53	45	44.39	9	1			
Union Power Station	CTG-1	27	27	27.65	-1	-1			
Union Power Station	CTG-2	26	26	25.569	0	0			
Union Power Station	CTG-3	32	32	24.32	8	8			
Union Power Station	CTG-4	30	30	22.269	8	8			
Union Power Station	CTG-5	27	27	26.004	1	1			
Union Power Station	CTG-6	26	26	25.052	1	1			
Union Power Station	CTG-7	32	32	27.869	4	4			
Union Power									

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Station									
White Bluff	1	2,116	1,533	2460.178	-344	-927	4145	4619.408	-474.408
White Bluff	2	2,130	1,544	1873.974	256	-330	4060	5099.951	-1039.951
Total		10,132	7,781	11,489	**-1,357**	**-3,708**	19849.65	23167.78	**-3318.13** (All EGUs) **-240.467** (Subject-to-BART EGUs Only)

Green cells indicate that budget or FIP-controlled scenarios are allow greater emissions than the respective EGU emitted during 2016.

All emissions estimates are in tons.

2016 Annual and Ozone Season NOx emissions were obtained from the Air Markets Program Database Query Tool. CSAPR allocations were obtained from the EPA Unit-level Allocations and Underlying Data for the CSAPR Update for the 2008 Ozone NAAQS Spreadsheet. FIP controlled emissions estimates were obtained from the Technical Support Document for EPA's Proposed Action on the Arkansas Regional Haze Federal Implementation Plan.

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