Regional Haze State Implementation Plan for Ohio

Prepared by:
The Ohio Environmental Protection Agency
Division of Air Pollution Control

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1. Background

In the 1977 amendments to the Clean Air Act (CAA), Congress established the goal of restoring national parks and wilderness areas to the "pristine" condition of atmospheric clarity that would prevail in the absence of human impacts. In 1999 the U.S Environmental Protection Agency (USEPA) issued a final version of a Regional Haze Rule having the purpose of achieving those pristine conditions by the year 2064.

Section 169 of the Act calls for the prevention of any future, and the remedying of any existing, human-made visibility impairment in Class I areas. Over the following years modest steps were taken to address the visibility problems in Class I areas; however, these measures mainly addressed plume blight from specific sources and did little to address regional haze issues in the Eastern United States (U.S.).

When the CAA was amended in 1990, Section 169B (42 USC 7492) was incorporated. This section provided for further research and regular assessments of the progress made to date. In 1993, the National Academy of Sciences concluded that "current scientific knowledge is adequate and control technologies are available for taking regulatory action to improve and protect visibility" (*Protecting Visibility in National Parks and Wilderness Areas*; National Research Council, Washington, DC: 1993). In addition to authorizing creation of visibility transport commissions and setting forth their duties, Section 169B(f) of the CAA mandated creation of the Grand Canyon Visibility Transport Commission (Commission) to make recommendations to the USEPA for the region affecting the visibility of the Grand Canyon National Park. After four years of research and policy development, the Commission submitted its report to USEPA in June 1996.
The Commission report, as well as the many research reports prepared by the Commission, contributed invaluable information to the USEPA in its development of the federal Regional Haze Rule.

USEPA's Regional Haze Rule was adopted July 1, 1999, and went into effect on August 30, 1999. The Regional Haze Rule aims at achieving national visibility goals by 2064. This rulemaking addressed the combined visibility effects of various pollution sources over a wide geographic region. This wide-reaching effort means that many states, including those without Class I areas, must participate in haze reduction efforts. USEPA designated five Regional Planning Organizations (RPOs) to assist with the coordination and cooperation needed to address the haze issue. Ohio participates in the Midwest Regional Planning Organization (MRPO) which is comprised of the northern Midwest states of Indiana, Illinois, Michigan, Ohio, and Wisconsin.

After adoption of the Regional Haze Rule, on May 24, 2002, the US Court of Appeals, DC District Court ruled on a challenge brought by the American Corn Growers Association. The Court remanded to the USEPA the "Best Available Retrofit Technology," or "BART," provisions of the rule, and denied industry's challenge to the haze rule goals of natural visibility and no degradation requirements. USEPA has revised the Regional Haze Rule pursuant to the remand and on July 6, 2005, finalized its guideline for determining BART.

On February 18, 2005, the US Court of Appeals, DC Circuit Court issued a ruling based on a second suit brought by the Center for Energy and Economic Development (CEED) challenging an optional emissions trading program (the WRAP Annex Rule). USEPA finalized revisions to the alternative trading programs on December 12, 2006.

This federal Regional Haze Rule establishes a schedule by which states must submit their first Regional Haze state implementation plan (SIP) and subsequent revisions to that first SIP, recognizing achieving natural visibility conditions will require long-term planning and review. USEPA was mindful of the "balance that must be maintained between the need for strategies that will achieve meaningful improvements in air quality and the need to provide appropriate flexibility for states in designing strategies that are responsive to both air quality and economic concerns." [64 FR 35731] Reasonable progress goals must be set for each Class I area and states must include a long-term strategy for making reasonable progress towards meeting the national goal in their first Regional Haze SIP. USEPA interprets "long-term strategy" as the control measures needed (and a demonstration of their effectiveness) to ensure reasonable progress during the first 10 to 15 year period of planning. USEPA selected the first planning period to extend to 2018, with a reassessment and revision of strategies as needed every 10 years. All Regional Haze SIPs are due three years after USEPA designates PM2.5 attainment and nonattainment areas. USEPA approved PM2.5 designations for all areas of each state on December 17, 2004, and determined that the Regional Haze SIPs were due by December 17, 2007.

This Regional Haze SIP addresses the first planning period (i.e., reasonable progress by the year 2018) and is submitted pursuant to 40 CFR 51.308(a) and (b). This SIP fulfills the requirements of:

- 40 CFR 51.308(d) which includes establishing reasonable progress goals, determining baseline conditions, determining natural conditions, providing a long-term strategy, providing an air quality monitoring strategy, and providing an emissions monitoring strategy; and

- 40 CFR 50.308(e) which includes establishing BART requirements.

1.1 States and Tribes Class I Areas

Ohio does not contain any Class I areas subject to the Regional Haze Rule. Ohio is required by 40 CFR 51.308(d) to address regional haze in each mandatory Class I area located outside the state which may be affected by emissions from within the state. Class I areas which may be affected by emissions from Ohio are discussed in Section 9. Ohio consulted with states and tribes in the MRPO region as outlined in Section 3 and Section 11. As a result of this consultation and the analyses performed, Ohio developed a long-term strategy for the first planning period (see Section 10) based upon the Class I areas affected by emissions from Ohio (see Section 9).

2. Regional Planning

Since the atmospheric contaminants degrading the atmosphere in a given park or wilderness area may have been transported by winds over a great distance, USEPA determined that control strategies to reduce those contaminants must involve participation by responsible parties on a region-wide basis, over a large area. Accordingly, USEPA has designated five regional planning organizations (RPOs) to cover the entire country. In October 2000, the States of Illinois, Indiana, Michigan, Ohio, and Wisconsin signed a memorandum of agreement that established the Midwest Regional Planning Organization (MRPO). Tribal leaders from Michigan and Wisconsin, USEPA Region V, and Federal Land Managers (FLMs) are also members of the MRPO. An operating principles document for the MRPO, which describes the roles and responsibilities of states, tribes, federal agencies, and stakeholders, was issued in March 2001.

Since the emissions of the MRPO region travel far outside the boundaries of those five states, MRPOs activities have included mutual consultation and sharing of information with other RPOs such as the Visibility Improvement State and Tribal Association of the Southeast (VISTAS).

This SIP utilizes data analysis, modeling results, and other technical support documents prepared by the MRPO for its members. The MRPO has established an active committee structure to address both technical and nontechnical issues related to regional haze. The Policy Steering Committee provides policy direction for regional planning. The Technical Steering Committee manages the technical portion of regional planning. The Project Team carries out the orders of the Technical Steering Committee and guides the development of the regional planning effort. Staff of the Lake Michigan Air Director’s Consortium (LADCO) provided much of the technical resources for the MRPO. LADCO was started in 1989 by the States of Illinois, Indiana, Michigan, and Wisconsin. Ohio later joined as the fifth state member. LADCO provides supportive activities for the three teams/committees.

MRPO works cooperatively with the RPOs representing other parts of the country. The other RPOs are Mid-Atlantic / Northeast Visibility Union (MANE-VU), Central Regional Air Planning Association (CENRAP), VISTAS, and Western Regional Air Partnership (WRAP). The following is a map of the regional planning organization boundaries:

The RPOs sponsored several joint projects with assistance by USEPA. MRPO maintains regular contact with the RPOs on technical and policy matters. By coordinating with MRPO and other RPOs, Ohio has worked to ensure that its long-term strategy and BART determinations provide reasonable reductions to mitigate impacts of sources from Ohio on affected Class I areas.

3. State and Federal Land Manager Coordination

Ohio has participated in meetings and conference calls with states within the MRPO and the RPOs outside the MRPO to discuss their assessments of visibility conditions, analyses of visibility impacts, and possible measures that could be taken for reasonable progress for the first planning period (2018). Section 9 and 10 of this document provides more detailed information regarding Ohio's long-term strategy to address visibility impacts and obtain Ohio's fair share of emissions reductions. Summaries of the calls and meetings held with states and RPOs with Class I areas in which Ohio participated can be found at: http://www.ladco.org/reports/rpo/consultation/index.php.

Coordination between states and FLMs is required by 40 CFR 51.308(i). Opportunities have been provided by MRPO for FLMs to review and comment on each of the technical documents developed by MRPO and referenced in this submittal. Ohio has provided agency contacts to the FLMs as required. In development of this plan submittal, the FLMs were consulted as required under 40 CFR 51.308(i)(2).

Ohio provides FLMs an opportunity for consultation, in person and at least 60 days prior to holding a public hearing on this plan submittal. During the consultation process, the FLMs are given the opportunity to address their:

• Assessment of the impairment of visibility in any Class I areas;

• Recommendations on the development of reasonable progress goals; and

• Recommendations on the development and implementation of strategies to address visibility impairment.

Ohio sent the draft plan to the FLMs on September 9, 2008. On October 16, 2008, Ohio received preliminary draft comments back from the FLMs (Appendix A) and addressed those comments in this final document. Ohio provided the revised document, based on comments, to the FLMs on December 29, 2008 and then submitted the document to USEPA on December 31, 2008. A public hearing was held on February 26, 2009 where additional comments were received from the public and the FLMs (Appendix G). This final document is the result of taking FLM, and other stakeholder, comments into consideration. On January 5, 2011, Ohio provided a draft federally enforceable permit that implements the Best Available Retrofit Technology (BART) requirements for P.H. Glatfelter to the public and FLMs. BART is discussed further in Section 8. Comments were accepted through February 11, 2011 and there was no request to hold a public hearing. Comments were received only from P.H. Glatfelter (Appendix H). The final federally enforceable BART permit was issued on March 7, 2011 after comments into consideration (Appendix H).

Ohio will continue to coordinate and consult with the FLMs during the development of future progress reports and revisions of this plan, as well as during the implementation of programs having the potential to contribute to visibility impairment in the mandatory Class I areas. This includes coordination with the FLMs during new source review (NSR) of sources that may impact Class I areas.

4. Baseline, Current and Estimated Natural Conditions

The goal of the Regional Haze Rule is to restore natural visibility conditions to the 156 Class I areas identified in the 1977 Clean Air Act Amendments. Section 51.301(q) defines natural conditions: "Natural conditions include naturally occurring phenomena that reduce visibility as measured in terms of light extinction[1], visual range, contrast, or

[1] Visibility impairment is caused by particles and gases in the atmosphere. Some particles and gases scatter light, while others absorb light. The net effect is called ''light extinction.'' The result of these processes is a reduction of the amount of light from a scene that is returned to the observer, creating a hazy condition.

coloration." Regional Haze SIPs must contain measures that make "reasonable progress" toward this goal by reducing anthropogenic emissions that cause haze.

40 CFR 51.308(d)(2) requires states with a mandatory Class I area to determine baseline and natural visibility conditions. Ohio does not have any Class I areas requiring this determination. First, states are to compare baseline visibility conditions in the years 2000 to 2004 (in deciview[2]) for the most impaired days[3] with the natural background conditions. Second, states identify a "uniform rate of progress" over a 60-year period that would be needed to achieve natural conditions by 2064. The uniform rate of progress is also known as the "glidepath." The glidepath is a straight line drawn from the baseline level of visibility impairment for 2000 to 2004 to the level representing natural conditions in 2064. The glidepath is one of the indicators used in setting reasonable progress goals. States identify the amount of progress needed during the first planning period consistent with the uniform rate of progress (third step). And lastly, fourth, states identify and analyze the emissions measures that would be needed to achieve this amount of progress during the first planning period.

Glidepaths were developed by the states and RPOs for their own Class I areas using their available information. MRPO also performed an analysis of these conditions for MRPO states, which Ohio accepts. This analysis is contained in the "Regional Air Quality Analyses for Ozone, PM2.5, and Regional Haze: Final Technical Support Document, April 25, 2008" (herein referred to as "TSD") (Appendix B) and is discussed further in Sections 7 and 10.

5. Monitoring Strategy

40 CFR 51.308(d)(4) requires a monitoring strategy for measuring, characterizing, and reporting regional haze visibility impairment that is representative of all mandatory Class I areas within the state. Ohio does not have any mandatory Class I areas.

Ohio is required by 40 CFR 51.308(d)(4)(iiii) to identify procedures by which monitoring data and other information are used in determining the contribution of emissions from within Ohio to visibility impairment at Class I areas in other states.

The monitoring strategy relies in part upon participation in the Interagency Monitoring of Protected Visual Environments (IMPROVE) network. The IMPROVE website is located at http://vista.cira.colostate.edu/improve/. Ohio also runs a large monitoring network of USEPA-approved monitors for ozone and PM2.5. Data from these monitors is used for a variety of reasons, including SIP development. Ohio is continually reviewing monitoring data as part of the SIP process.

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[2] ''Deciview'' is a visibility metric defined in 40 CFR 51.301(bb). Higher deciview values indicate greater levels of visibility impairment.

[3] "Most impaired days" is equivalent to the 20 percent worst visibility days. States also must ensure no degradation in visibility for the least impaired days which is equivalent to the 20 percent best visibility days.

For regional haze, monitoring data were analyzed to produce a conceptual understanding of the air quality problems. Additional discussions on the use of monitoring data can be found under Section 9 and in the TSD document (Appendix B).

6. Emissions Inventory

Ohio is required by 40 CFR 51.308(d)(4)(v) to provide a statewide emissions inventory of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I area(s). Emissions data are derived from MRPO and the National Emissions Inventory (NEI) (Appendix C).

Emissions[4]

The following is Ohio's baseline year, 2002, inventory[5]:

Data sources: All data: 2002 National Emissions Inventory System
http://www.epa.gov/air/data/neidb.html

Ohio 2002 Emissions Summary, by Source Category and Pollutant

Source category	**VOC**	**NOx**	**PM2.5**	**PM10**	**NH3**	**SO2**
	tons/yr					
EGU Point	1,706	360,551	54,722	60,019	80	1,012,132
Non-EGU	27,292	28,089	15,581	33,976	6,524	96,143
Non-Road	90,447	91,256	8,234	8,942	74	6,792
Other	287,487	78,029	17,169	23,268	107,425	8,350
MAR*	3,632	96,728	3,113	3,393	32	11,191
On-Road	184,072	327,337	5,933	8,049	10,987	12,682
Totals	594,636	981,990	104,752	137,647	125,121	1,147,290

*Marine, Airplane and Railroad

4 Agricultural NH3 emissions are included in the "other" category in the tables.
5 The 2002 inventory does not include fugitive dust and specifically road dust nonpoint sources, which are discussed in the nonpoint summaries below.

The following is Ohio's current year, 2005, inventory:

Data sources: On-Road data: 2005 National Emissions Inventory System
http://www.epa.gov/air/data/neidb.html

All other data: Midwest Regional Planning Organization (MRPO) and Lake Michigan Air Directors Consortium (LADCO) Web site:
http://www.ladco.org/tech/emis/round5/index.php

Ohio 2005 Emissions Summary, by Source Category and Pollutant

Source category	**VOC**	**NOx**	**PM2.5**	**PM10**	**NH3**	**SO2**
	tons/yr					
EGU Point	1,354	255,556	9,158	17,324	107	1,100,511
Non-EGU	27,848	66,229	9,920	15,012	3,175	115,547
Non-Road	89,584	85,887	7,384	7,719	77	8,747
Other	226,910	39,582	16,708	16,764	109,047	5,632
MAR	2,706	47,021	1,452	1,634	27	4,687
On-Road	171,331	259,299	4,735	6,797	11,381	6,290
Totals	519,734	753,573	49,357	65,249	123,813	1,241,414

These 2005 emissions were grown to year 2018, primarily using the Economic Growth Analysis System (EGAS5), MOBILE 6.2 vehicle emission modeling software, and the Integrated Planning Model (IPM) version 3.0 for electric generating units (EGUs). Additional details are provided in the TSD (Appendix B). The following is Ohio's projected 2018 inventory:

Data source: Midwest Regional Planning Organization (MRPO) and Lake Michigan Air Directors Consortium (LADCO) Web site:
http://www.ladco.org/tech/emis/round5/index.php

Ohio 2018 Emissions Summary, by Source Category and Pollutant

Source category	**VOC**	**NOx**	**PM2.5**	**PM10**	**NH3**	**SO2**
	tons/yr					
EGU Point	1,352	95,678	9,154	17,311	107	315,560
Non-EGU	34,651	66,696	11,776	18,161	4,300	117,018
Non-Road	60,461	37,691	3,526	3,728	86	100
Other	182,075	38,441	18,359	18,409	117,264	4,957
MAR	1,146	22,018	538	615	18	2,494
On-Road	88,526	100,056	2,483	2,529	12,067	1,455
Totals	368,211	360,579	45,836	60,752	133,842	441,584

The following table represents the percent changes in the inventory based on the emissions in the previous tables. Discussions of the projected changes for different source categories follows.

Percent Changes in Ohio Emissions, by Source Category and Pollutant, from 2002 to 2005 to 2018

Source category	**VOC**		**NOx**		**PM2.5**		**PM10**		**NH3**		**SO2**	
	’02 - ‘05	**’05 -‘18**	**’02 - ‘05**	**’05 -‘18**	**’02 - ‘05**	**’05 -‘18**	**’02 - ‘05**	**’05 -‘18**	**’02 - ‘05**	**’05 -‘18**	**’02 - ‘05**	**’05 -‘18**
EGU Point	-20.6	-0.1	-29.1	-62.6	-83.3	0.0	-71.1	-0.1	33.7	0.1	8.7	-71.3
Non-EGU	2.0	24.4	135.8	0.7	-36.3	18.7	-55.8	21.0	-51.3	35.4	20.2	1.3
Non-Road	-1.0	-32.5	-5.9	-56.1	-10.3	-52.2	-13.7	-51.7	4.1	12.4	28.8	-98.9
Other	-21.1	-19.8	-49.3	-2.9	-2.7	9.9	-28.0	9.8	1.5	7.5	-32.5	-12.0
MAR	-25.5	-57.7	-51.4	-53.2	-53.4	-63.0	-51.8	-62.3	-15.0	-31.9	-58.1	-46.8
On-Road	-6.9	-48.3	-20.8	-61.4	-20.2	-47.6	-15.6	-62.8	3.6	6.0	-50.4	-76.9
Totals	-12.6	-29.2	-23.3	-52.2	-52.9	-7.1	-52.6	-6.9	-1.0	8.1	8.2	-64.4
Total Change From 2002 to 2018	-38.08%		-63.28%		-56.24%		-55.86%		6.97%		-61.51%	

The majority of visibility-impairing point source emissions in Ohio currently comes from EGUs. This source category represented 88 percent of the reported SO2 emissions and 37 percent of the NOx emissions for the 2002 inventory year. For 2002, mobile source emissions is the second largest source of NOx and VOC emissions, 31 percent and 33 percent, respectively. The largest source of VOC emissions in 2002, 48 percent, is from other, or area, sources.

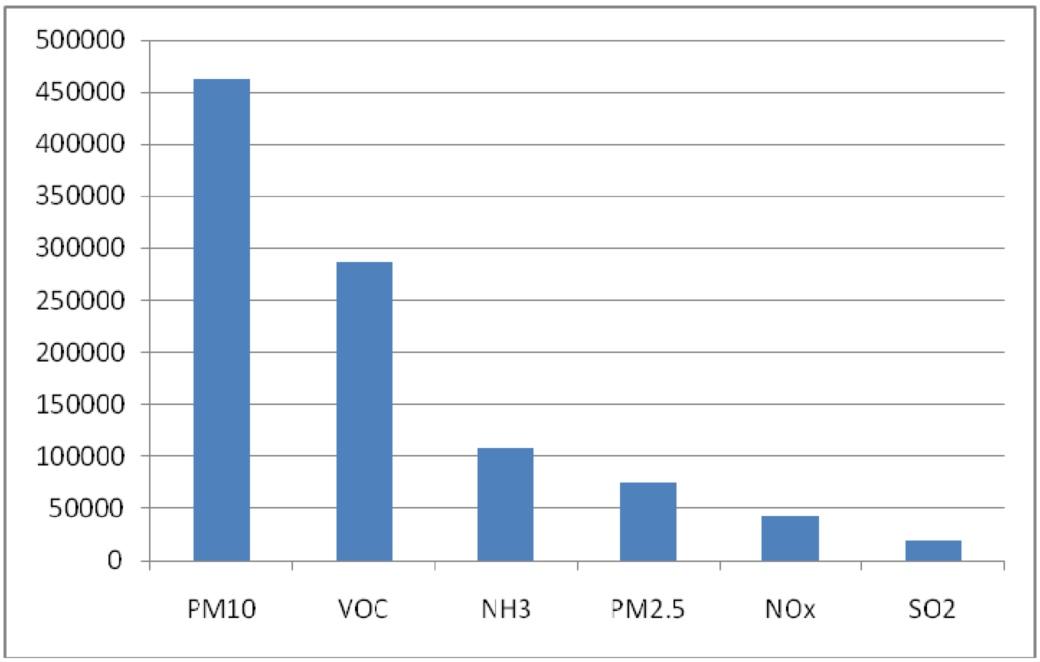
This pattern remained fairly consistent in 2005. However, the largest source of NOx emissions in 2005 was from mobile sources, 34.4 percent, rather than EGU sources, 33.9 percent. Emissions of NOx from EGUs is steadily declining primarily due to the NOx SIP call.

Projected emissions for 2018 show dramatic reductions due to the Clean Air Interstate Rule (CAIR) program. The CAIR program and implications regarding its vacatur, remand, and replacement are discussed in greater detail in Section 10. Emissions of NOx and SO2, considering CAIR, are expected to decline between 2002 and 2018 by about 63 percent and 62 percent, respectively. As seen in the percent change table above, emissions of all pollutants, except NH3, are expected to decline by 2018.

6.1 Nonpoint Sources

Nonpoint source emissions were compiled from the 2002 NEI database. As indicated in the percent change table above, all area, or nonpoint, source emissions are projected to decline by 2018 with the exception of NH3, PM10 and PM2.5 which are projected to increase slightly.

2002 Total Emissions (TPY) of Pollutants Contributing to Regional Haze from Ohio Nonpoint Sources



* Recall, the 2002 inventory identified in the table above does not include fugitive dust and specifically road dust nonpoint sources, which are identified in the bar chart above and discussed below.

PM10 accounts for the largest nonpoint source category, and can be attributed primarily to agriculture tillage, unpaved and paved road dust, and industrial road construction activities. The following tables provide the relative contributions from the top sources of nonpoint emissions for the state for each of the above pollutants. These values are based on the 2002 NEI.

Top PM10 Emissions from Ohio Nonpoint Sources During 2002

Source classification	**tons/yr**	**% of Nonpoint PM10**
Agriculture Tillage	149,656	32.36%
Unpaved Roads	100,824	21.80%
Paved Roads	89,467	19.35%
Road Construction (Industrial Processes)	48,771	10.55%
Industrial/Commercial/Institutional Construction (Industrial Processes)	25,294	5.47%
Mining and Quarrying (Industrial Processes)	17,882	3.87%

VOC emissions are the second largest source of Ohio's nonpoint emissions. A large portion of these emissions result from industrial and consumer product utilization (nearly 25 percent). Ohio promulgated a consumer products rule on September 15, 2007. Effective January 1, 2009, consumer products that are sold in the State of Ohio will have to meet stringent VOC content limitations[6]. This will help to reduce VOC emissions for this nonpoint source category in the future. In addition, VOC reductions from nonpoint sources will be achieved by Ohio's Architectural and Industrial Maintenance (AIM) Coatings rule[7] and Portable Fuel Container rule[8], both of which were recently promulgated.

Top VOC Emissions from Ohio Nonpoint Sources During 2002

Source classification	**tons/yr**	**% of Nonpoint VOC**
Miscellaneous Non-industrial: Consumer Solvent Utilization	41,688	14.50%
Miscellaneous Industrial Solvent Utilization	29,937	10.41%
Degreasing Solvent Utilization	17,877	6.22%
Residential Wood Stoves and Fireplaces	14,962	5.20%

Ammonia is the third largest source of Ohio's nonpoint emissions. The majority of these emissions, 98.0 percent, result from agriculture production activities: crops, cattle, swine, and poultry production mainly. However, Ohio EPA's Division of Air Pollution Control has a very limited authority under the Ohio Revised Code to regulate agricultural activities.

[6] http://www.epa.ohio.gov/dapc/regs/3745_112.aspx
[7] http://www.epa.ohio.gov/dapc/regs/3745_113.aspx
[8] http://www.epa.ohio.gov/portals/27/regs/3745-21/21_17.pdf

Top NH_3 Emissions from Ohio Nonpoint Sources During 2002

Source classification	tons/yr	% of Nonpoint NH3
Urea from Fertilizer Application of Crops	17,008	15.81%
Nitrogen Solutions from Fertilizer Application of Crops	16,348	15.20%
Confined Poultry Production - layers with dry manure manage	11,165	10.38%
Poultry Waste Emissions	9,719	9.03%

Agriculture tilling contributes over 30 percent of the $PM_{2.5}$ emissions for nonpoint sources in Ohio. Paved and unpaved roadways contribute a combined 21.6 percent. These sources are also significant contributors of PM_{10} emissions as demonstrated above.

Top $PM_{2.5}$ Emissions from Ohio Nonpoint Sources During 2002

Source classification	tons/yr	% of Nonpoint PM2.5
Agriculture Tillage	22,448	30.16%
Unpaved Roads	10,086	13.55%
Residential Woodstoves and Fireplaces	8,937	12.00%
Open Burning of Residential Household Waste	6,763	9.09%
Paved Roads	5,978	8.03%
Road Construction (Industrial Processes)	4,901	6.58%
Mining and Quarrying (Industrial Processes)	3,576	4.80%
Open Burning of Land Clearing Debris	3,494	4.69%

The majority of nonpoint source NO_x emissions results from natural gas combustion, whether from residential, industrial, or commercial and institutional sources.

Top NO_x Emissions from Ohio Nonpoint Sources During 2002

Source classification	tons/yr	% of Nonpoint NOx
Residential Natural Gas Combustion	15,100	36.33%
Industrial Natural Gas Boilers and IC Engines Combustion	7,547	18.16%
Commercial and Institutional Natural Gas Boilers and IC Engines Combustion	7,163	17.24%
Residential Liquid Petroleum Gas Combustion	3,121	7.51%

The majority of nonpoint source SO_2 emissions results from oil and coal combustion, whether from residential, industrial or commercial and institutional sources.

Top SO2 Emissions from Ohio Nonpoint Sources During 2002

Source classification	tons/yr	% of Nonpoint SO2
Industrial Residual Oil Boiler Combustion	7,539	37.81%
Commercial and Institutional Bituminous/Subbituminous Coal Boiler Combustion	6,324	31.71%
Industrial Distillate Oil Boilers and IC Engines Combustion	1,977	9.92%
Commercial and Institutional Distillate Oil Boilers and IC Engines Combustion	1,682	8.43%
Residential Bituminous/ Subbituminous Coal Combustion	1,263	6.33%

The Regional Haze SIP requirements include assessing the contribution of construction activities and fires from Ohio.

6.2 Construction Activities

The following table identifies emissions from the 2002 NEI attributed to construction activities. Additional information on construction activities is discussed under Section 10.

Emissions from Ohio Nonpoint Construction Activities Sources During 2002

		2002 TPY	
NOx			**% Total NOx**
Off-Highway	Non-Road Diesel	32,431	3.3%
Off-Highway	Non-Road Gasoline	889	0.09%
PM10			**% Total PM10**
Miscellaneous	Other Fugitive Dust	77,713	16.8%
Industrial Processes (area source)	Road Construction	48,771	10.5%
Industrial Processes (area source)	Industrial/Commercial/Institutional	25,294	5.5%
Industrial Processes (area source)	Residential	3,647	0.8%

Off-Highway	Non-Road Diesel	2,775	0.6%
Off-Highway	Non-Road Gasoline	130	0.03%
PM2.5			**% Total PM2.5**
Miscellaneous	Other Fugitive Dust	7,809	10.5%
Industrial Processes (area source)	Road Construction	4,901	6.6%
Off-Highway	Non-Road Diesel	2,692	3.6%
Industrial Processes (area source)	Industrial/Commercial/Institutional	2,542	3.4%
Industrial Processes (area source)	Residential	366	0.5%
Off-Highway	Non-Road Gasoline	120	0.2%
VOC			**% Total VOC**
Off-Highway	Non-Road Gasoline	3,310	0.6%
Off-Highway	Non-Road Diesel	3,058	0.5%
SO2			**% Total SO2**
Off-Highway	Non-Road Diesel	4,141	0.4%
Off-Highway	Non-Road Gasoline	24	0.002%

6.3 <u>Fires</u>

The following table identifies emissions from the 2002 NEI contributed from fire activities. In Ohio, open burning represents the majority of emissions from fire/burning activities. Wildfires and prescribed burning are not significant emission sources for Ohio. Fires are not a significant contribution to emissions in Ohio. Ohio EPA's regulations for open and prescribed burning are discussed under Section 10.

Emissions from Ohio Nonpoint Fire Sources During 2002

			2002 TPY	
NOx				**% Total NOx**
Waste Disposal & Recycling	Open Burning	residential	1,166	0.1%
Waste Disposal & Recycling	Open Burning	land clearing debris	1,028	0.1%
Miscellaneous	Other Combustion	prescribed burning	85	0.009%
Miscellaneous	Other Combustion	structural fires	18	0.002%
Miscellaneous	Other Combustion	forest wildfires	9	0.001%
PM10				**% Total PM10**
Waste Disposal & Recycling	Open Burning	residential	7,385	1.6%
Waste Disposal & Recycling	Open Burning	land clearing debris	3,494	0.8%
Miscellaneous	Other Combustion	prescribed burning	767	0.2%
Waste Disposal & Recycling	Open Burning	yard waste	360	0.08%
Miscellaneous	Other Combustion	structural fires	137	0.03%
Miscellaneous	Other Combustion	forest wildfires	87	0.02%
PM2.5				**% Total PM2.5**
Waste Disposal & Recycling	Open Burning	residential	6,763	9.1%
Waste Disposal & Recycling	Open Burning	land clearing debris	3,494	4.7%
Miscellaneous	Other Combustion	prescribed burning	650	0.9%
Waste Disposal & Recycling	Open Burning	yard waste	360	0.5%
Miscellaneous	Other Combustion	structural fires	125	0.2%
Miscellaneous	Other Combustion	forest wildfires	74	0.1%

VOC				% Total VOC
Waste Disposal & Recycling	Open Burning	residential	5,830	1.0%
Waste Disposal & Recycling	Open Burning	land clearing debris	2,384	0.4%
Miscellaneous Area Sources	Other Combustion	prescribed burning for forest management	1,748	0.3%
Waste Disposal & Recycling	Open Burning	yard waste	307	0.05%
Miscellaneous Area Sources	Other Combustion	forest wildfires	207	0.03%
Miscellaneous	Other Combustion	structural fires	140	0.02%
SO2				**% Total SO2**
Waste Disposal & Recycling	Open Burning	residential	194	0.02%
Miscellaneous	Other Combustion	prescribed burning	1264	0.01%
Miscellaneous	Other Combustion	forest wildfires	6	0.0005%
PM				N/AP
Miscellaneous Area Sources	Other Combustion	forest wildfires	125	
NH3				**% Total NH3**
Miscellaneous Area Sources	Other Combustion	prescribed burning for forest management	1265	0.1%
Miscellaneous Area Sources	Other Combustion	forest wildfires	145	0.01%

7. Modeling Assessment

Appendix W of 40 CFR Part 51 contains modeling guidelines for conducting regional-scale visibility modeling. USEPA provides recommendations on appropriate models and MRPO chose the Comprehensive Air Quality Model with extensions (CAMx) with emissions and meteorology generated using EMS (and CONCEPT) and MM5, respectively. The selection of CAMx as the primary model is based on several factors: performance, operator considerations (e.g., ease of application and resource requirements), technical support and documentation, model extensions (e.g., 2-way nested grids, process analysis, source apportionment, and plume-ingrid), and model science. This is the same model used for ozone and PM2.5 SIPs.

The air quality analysis conducted by MRPO includes weight-of-evidence approaches which rely on extensive qualitative and quantitative data analysis and modeling. Given uncertainties in emissions inventories and modeling, these data analyses are a necessary part of the overall technical support. The analyses are as follows: emissions analyses, meteorological analyses, time series (hour of day/day of week/seasonal) patterns, trajectory analyses, source apportionment, spatial pattern analyses, episodic analyses, data analysis infrastructure, and modeling analyses. Trajectory analyses are used as the primary method to determine which Class I areas are affected by emissions from Ohio, as discussed in Section 9.1. Results from a source apportionment analysis were also considered. CAMx was applied to provide source contribution information for the first planning period (2018 conditions) and those results are discussed in Section 9.2.

Modeling includes base year analyses for 2002 and 2005 to evaluate model performance and future year strategy analyses to assess candidate control strategies. The analyses were conducted in accordance with USEPA's modeling guidelines[9]. The modeling covers each full calendar year (2002 and 2005) for an eastern U.S. 36 km domain. Emission inventories were prepared for the two base years: 2002 (Base K) and 2005 (Base M), and several future years: 2008, 2009, 2012, and 2018. The Base M -2005 emissions inventory was used to project the 2018 emissions inventory results used as part of this SIP. However, portions of this document will refer to the modeling results predicted by both the 2002 and 2005 inventories. Further details of the emission inventories are provided in two summary reports[10] and the following pages of the LADCO web site:

http://www.ladco.org/tech/emis/basek/BaseK_Reports.htm
http://www.ladco.org/tech/emis/round5/index.php

For on-road, nonroad, ammonia, and biogenic sources, emissions were estimated by models. For the other sectors (point sources, area sources, and MAR (commercial marine, aircraft, and railroads)), emissions were prepared using data supplied by the states and other RPOs. Emissions from EGUs were predicted based on USEPA's IPM (version 2.1.9 for 2002 and version 3.0 for 2005).

Section 10 and the TSD (Appendix B) identify the "on-the-books" controls used to prepare the future year projections.

For regional haze, the calculation of future year conditions assumed:

- baseline concentrations based on 2000-2004 IMPROVE data, with updated (substituted) data for Mingo, Boundary Waters, Voyageurs, Isle Royale, and

[9] "Guidance for on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze", EPA-454/B07-002, April 2007.
[10] "Base K/Round 4 Strategy Modeling" Emissions", May 16, 2006; "Base M Strategy Modeling: Emissions (Revised)", February 27, 2008. Available at: http://www.ladco.org/reports/general/

Seney (see “Impact of Missing Data on Worst Days at Midwest Northern Class I Areas”, March 12, 2007 (revised 6/19/07));

- use of the new IMPROVE light extinction equation; and
- use of EPA default values for natural conditions, based on the new IMPROVE light extinction equation.

The uniform rate of visibility improvement values for the 2018 planning year were derived (for the 20 percent worst visibility days) based on a straight line between baseline concentration values (plotted in the end year of the 5-year baseline period (2004)) and natural condition value (plotted in the year for achieving natural conditions (2064)). Plots of these “glide paths” with the Base M modeling results and a summary of measured baseline and modeled future year deciview values for these Class I areas are discussed in Section 10.6.8.

The haze results show that several Class I areas in the eastern U.S. are expected to be greater than (less improved than) the uniform rate of visibility improvement values (in 2018), including those in northern Michigan and several in the northeastern U.S. Many other Class I areas in the eastern U.S. are expected to be less than (more improved than) the uniform rate of visibility improvement values (in 2018). As noted above, states should consider these results, along with information on the other four factors, in setting reasonable progress goals.

Full details of the modeling protocol and performance can be found in Section 3 of the TSD (Appendix B).

8. BART Analysis

USEPA’s 1999 Regional Haze Rule requires Ohio to have additional controls for certain sources that contribute to visibility impairment in Class I areas (Best Available Retrofit Technology (BART)) or implement an emissions trading or other alternative program that will achieve greater reasonable progress than would be achieved through the installation and operation of BART. On July 6, 2005, USEPA published a revised final rule, including Appendix Y to 40 CFR part 51 “Guidelines for BART Determinations under the Regional Haze Rule,” (hereafter referred to as “BART Guidelines”).

8.1 BART Eligible Sources in Ohio

A preliminary list of Ohio BART-eligible sources were identified using the methodology in the BART Guidelines. For an emission source to be identified as BART eligible, Ohio used these criteria from the BART Guidelines:

- One or more emissions units at the facility fit within one of the 26 categories listed in the BART Guidelines.

- The emission unit was in existence on August 7, 1977 and began operation at some point on or after August 7, 1962.

- The limited potential emissions from all emission units identified in the previous two bullets were 250 tons or more per year of any of these visibility-impairing pollutants: SO2, NOx, or PM.

To identify the preliminary list of sources that meet the criteria above, Ohio performed the following activities:

- Reviewed the Ohio EPA/Division of Air Pollution Control (OEPA/DAPC) emissions inventory files, to identify candidate sources for BART eligibility, based on SIC code and installation date. This review turned up 35 candidate facilities, including 14 EGUs; and

- Sent questionnaires to the 21 potentially affected non-EGU facilities identified in the review of the inventory files. A sample questionnaire is provided as Appendix B of the attached BART Technical Support Document (herein referred to as BART TSD) (the BART TSD is contained in Appendix D).

8.2 Determination of Sources Subject to BART

Under the BART Guidelines, states have the following options regarding BART-eligible sources: (a) make BART determinations for all sources, or (b) consider exempting some sources from BART because they do not cause or contribute to visibility impairment in a Class I area. Ohio chose option (b). If a state chooses that option, then the BART Guidelines suggest three sub-options for determining that certain sources need not be subject to BART:

- Individual source attribution approach (dispersion modeling).

- Use of model plants to exempt sources with common characteristics.

- Cumulative modeling to show that no sources in a state are subject to BART.

8.2.1 Individual Source Attribution Approach (Dispersion Modeling)

Under this option, CALPUFF (or other appropriate models) can be used to show that SO2, NOx, and direct PM emissions from an individual source do not cause or contribute to visibility impairment in a Class I area. The first step in this approach is to prepare a modeling protocol. MRPO drafted a CALPUFF modeling protocol ("Single

Source Modeling to Support Regional Haze BART" contained in Appendix F-m of the BART TSD)[11]. For the purposes of this analysis, the threshold value used to determine whether a source causes or contributes to visibility impairment is 0.5 deciview.

Analysis by MRPO showed there were more than 100 BART-eligible non-EGU sources in the 5-state region. CALPUFF modeling for all these sources was not considered necessary. This is because previous CALPUFF modeling (conducted in response to USEPA's proposed BART rule) indicated that only sources with a Q/D value > 10 – 20 had more than a 0.5 deciview visibility impact in a nearby Class I area (MRPO's "Determining Which BART-Eligible Sources are Subject to BART: Summary", December 21, 2004.) Consequently, new CALPUFF runs were performed with those sources with a Q/D value > 5. (The Q/D values were calculated using the minimum distance to a Class I area and potential emissions, if available, or actual emissions, if potential emissions were not available.)

8.2.2 Use of Model Plants

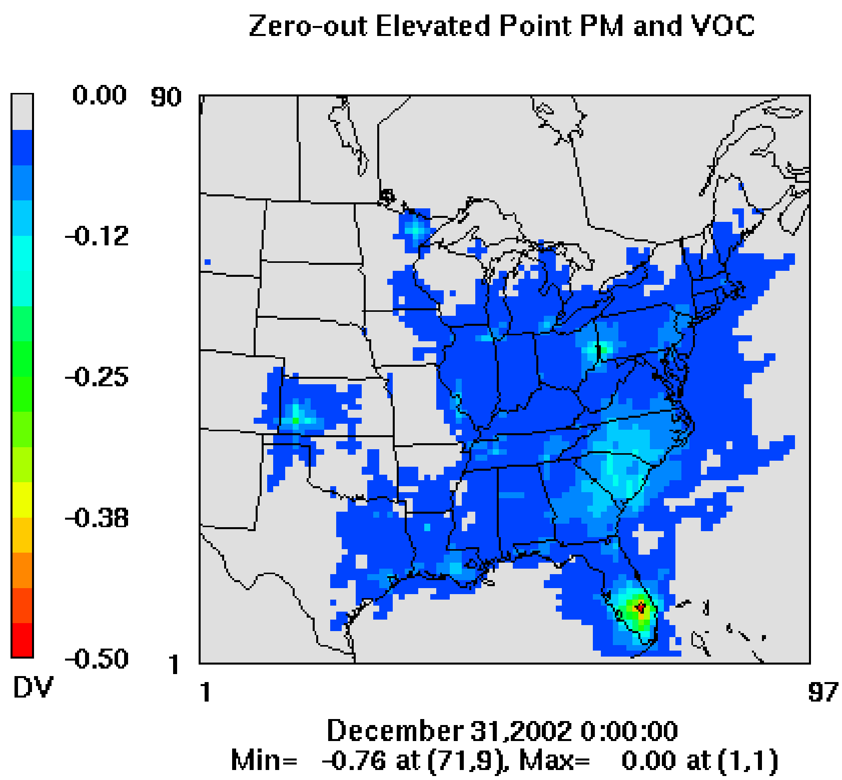
Under this option, analyses of model plants can be used to exempt sources that share specific characteristics. CALPUFF modeling was performed by USEPA of model plants (EGUs and non-EGUs) with representative plume characteristics to assess the visibility impact from emission sources of difference sizes and distances from two hypothetical Class I areas (one in the East and one in the West). Based on these analyses, USEPA concluded that if a state establishes 0.5 deciview as a contribution threshold, then the state could exempt sources with combined SO2 and NOx emissions of less than 500 TPY located more than 50 km from a Class I area, or less than 1000 TPY located more than 100 km from a Class I area. (Note, in "Q&A's for Source by Source BART rule" of July 6, 2005" (Revision 1, October 31, 2005), USEPA approved the use of these emissions-distance criteria by states to exempt sources from BART review.) These emissions-distance criteria are consistent with a Q/D value < 10.

8.2.3 Cumulative Modeling

Under this option, modeling of total visibility impacts from all BART-eligible sources in a given state can be used to show that they collectively do not cause or contribute to visibility impairment in a Class I area. This approach was used to assess the likelihood that VOC and PM emissions will not cause or contribute to visibility impairment. Specifically, CAMx was run with all point source VOC and PM emissions eliminated ("zeroed-out") to assess the contribution of these species to visibility impairment. The model results shown below demonstrate that these emissions do not contribute to visibility impairment (i.e., less than a 0.5 deciview impact in any Class I area). Because the VOC and PM emissions from just the BART-eligible sources are much less than

[11] The procedures and assumptions in this CALPUFF modeling are specific to the BART analysis (i.e., to help determine which BART-eligible sources are subject to BART), and may not necessarily be applicable to CALPUFF modeling performed for other purposes, including new source review analyses.

those from all point sources, the visibility impact of these emissions from the BART-eligible sources will be much less than 0.5 deciview in any Class I area. Thus, these emissions can be excluded from BART review. In addition, ammonia emissions can be excluded from BART review, given that these emissions from the BART-eligible sources are relatively small (i.e., ammonia emissions from all point sources make up only 1 percent of the total ammonia emissions in the region).



8.2.4 EGUs

The BART-eligible EGUs in Ohio were not subjected to Q/D analysis or dispersion modeling because of Ohio's decision that CAIR would suffice for their control, as discussed below. The following 18 generating stations include an aggregate of 37 BART-eligible units (from Appendix H of the BART TSD):

Station	County	No. of BART-eligible units
J. M. Stuart	Adams	4
Ashtabula	Ashtabula	4
City of St. Mary's	Auglaize	1
City of Hamilton	Butler	2
W. C. Beckjord	Clermont	2
Conesville	Coshocton	3
Gen. J. M. Gavin	Gallia	2
Miami Fort	Hamilton	1
Cardinal	Jefferson	3
W. H. Sammis	Jefferson	4
Eastlake	Lake	2
City of Painesville	Lake	2
Avon Lake	Lorain	1
Bay Shore	Lucas	1
Muskingum River	Morgan	1
City of Shelby	Richland	2
City of Dover	Tuscarawas	1
City of Orrville	Wayne	1

With respect to emissions of NOx and SO2 from EGUs, Ohio chooses the option allowed under 40 CFR 51.308(e)(2). This provision provides that a state may impose a cap-and-trade emissions program in lieu of BART requirements, if it can be shown that the program will provide a greater rate of progress toward visibility improvement goals than would BART. USEPA has determined that the cap-and-trade provisions of the CAIR under 40 CFR Part 96 AAA-EEE do establish such a program in relation to emissions of NOx and SO2 from EGUs, and this determination that CAIR is an acceptable alternative to BART for EGUs has been codified in 40 CFR 51.308(e)(4). The CAIR program and implications regarding its vacatur and remand are discussed in greater detail in Section 10.

With respect to emissions of VOC and PM from EGUs, the cumulative modeling, as discussed above under Section 8.2.3, demonstrates that these emissions do not contribute to visibility impairment (i.e., less than a 0.5 deciview impact in any Class I area).

Thus, Ohio EPA has determined EGUs do not have to conduct BART control analyses as a requirement for this SIP.

8.2.5 Detailed Analysis of Potential BART-Subject Sources

The result of the preliminary review discussed under Sections 8.1 and 8.2 was that twelve facilities were identified as needing a detailed analysis using the CALPUFF computer model. This includes one facility (Degussa) which was overlooked at the outset, and several that were provided a Q/D analysis based on faulty source locations. Ohio determined CALPUFF modeling would be conducted rather than reanalyzing the Q/D calculation for those facilities. Appendix D of the BART TSD contains the results of the analysis along with the Q/D values. Those twelve include the following:

	City	**County**
Cemex	Xenia	Greene
Chemtrade Logistics	Cairo	Allen
Cinergy Solutions	St. Bernard	Hamilton
Cognis	Cincinnati	Hamilton
Degussa	Belpre	Washington
P. H. Glatfelter	Chillicothe	Ross
Martin Marietta	Woodville	Sandusky
Ormet	Hannibal	Monroe
Owens Corning	Newark	Licking
Premcor	Lima	Allen
Sun	Oregon	Lucas
WCI Steel	Warren	Trumbull

Ohio chose individual source attribution by dispersion modeling to determine which sources cause or contribute to visibility impairment and, therefore, are subject to BART. The CALPUFF modeling protocol used to determine which BART-eligible facilities are subject to BART (developed by MRPO) is included as Appendix F-m in the BART TSD. The procedure involves modeling visibility impacts at the following sixteen Class I areas:

Class I Area	**State(s)**
Boundary Waters Canoe Area	Minnesota
Brigantine National Wildlife Refuge	New Jersey
Dolly Sods/Otter Creek Wilderness	W. Virginia
Great Gulf Wilderness	New Hampshire
Great Smoky Mountains National Park	Tennessee, N. Carolina
Hercules-Glades	Missouri
Isle Royale National Park	Michigan
James River Face	Virginia
Linville Gorge	N. Carolina

Lye Brook Wilderness	Vermont
Mammoth Cave National Park	Kentucky
Mingo Wilderness Area	Missouri
Seney Wilderness Area	Michigan
Shenandoah National Park	Virginia
Sipsey Wilderness	Alabama
Voyageurs National Park	Minnesota

A source is considered subject-to-BART if, for any of the years 2002, 2003, and 2004, it causes eight or more days of visibility degradation exceeding 0.5 deciview at any one of the above-listed Class I areas. The pollutants modeled are SO2, NOx, primary PM2.5, HNO_3, and SO_4. Generally no data were available for the latter two pollutants.

The operation of the model was consistent with MRPO's protocol document and employed run scripts and postprocessor routines supplied by MRPO. The basis for the mass rates of emission varied from source to source. Generally, permit allowables were used, but where emissions were not restricted by permit, actual values were found in Ohio EPA's emission inventory or in data supplied by the company. If the data were taken from the annual inventory, the annual release was divided by actual hours of operation (also found in the inventory) to arrive at the pounds per hour to be used for modeling. This approach was judged to be satisfactory for facilities with impacts well below the eight days/year exceedance level, but inadequate for the one source, P. H. Glatfelter Company ("Glatfelter"), with larger impacts. For Glatfelter, three years of daily emission data were reviewed, to identify the single day of highest combined emission of all BART-eligible sources. This gave rise to a modeled emission rate higher than would have been used if permit allowables had served as the basis. (This does not indicate a violation by Glatfelter, since the permit allowable is based on a 30-day averaging period.) Notes on the model inputs for each facility appear in Appendix F-I of the BART TSD.

The CALPUFF modeling shows one facility (Glatfelter) with visibility impacts above the eight days per year threshold, and all other facilities well below. Accordingly, this study finds that Glatfelter's two large coal-fired boilers are the only non-EGU "subject-to-BART" sources in Ohio. Glatfelter has worked cooperatively with Ohio EPA to identify potential emission controls and analyze all the site-specific factors that are required as part of a BART determination. The BART determination for Glatfelter is summarized in the BART TSD, and the full document is contained in Appendix G of the BART TSD.

The attached BART TSD also contains details of the Q/D analysis and the dispersion modeling.

8.3 Determination of BART Requirements for Subject-to-BART Sources

The one non-EGU subject-to-BART facility in Ohio, Glatfelter in Chillicothe, hired the BE & K Engineering consulting firm to perform a BART analysis according to applicable guidelines. The consultant's report, attached as Appendix G to the BART TSD, includes an analysis of the requirements of 40 CFR 51.308(e)(1)(iii) which states BART must be based on analysis of the best system of continuous emissions control available and reductions achievable, and the following factors must be considered in making the source-specific BART determination:

- Technology available;
- Costs of compliance;
- Energy and non-air quality environmental impacts of compliance;
- Existing pollution control technology in use at the source;
- Remaining useful life of the source; and
- Degree of improvement in visibility that may reasonably be anticipated to result from the use of such technology.

On a variety of grounds, including technical feasibility and negligible visibility impacts as demonstrated by CALPUFF modeling, NOx and primary particulate emissions were determined to require no control beyond what is currently provided. The analysis conducted by BE & K Engineering narrowed the full range of possibilities for SO2 control down to three specific technologies meriting detailed study:

- Wet Flue Gas Desulfurization (FGD)
- Semi-Dry FGD
- Overfire Air and Sorbent Injection System (OASIS)

The three technologies are targeted toward SO2 reduction. They are capable of 90 percent, 90 percent, and 60 percent removal of SO2, respectively. The company performed a detailed Monte Carlo financial analysis including cost of construction, and operating costs such as those of electricity, reagents and waste disposal. Taking this analysis into consideration in conjunction with the CALPUFF modeling results, Ohio determined that a process capable of 90 percent SO2 removal was appropriate. Upon further discussions with Glatfelter it was decided that Glatfelter would implement an alternative program to BART as allowed under 40 CFR 51.308(e)(2). An alternative BART measure must achieve greater reasonable progress than would be achieved through the installation and operation of BART. If the alternative measure results in greater emission reductions, then the alternative measure is deemed to achieve greater reasonable progress. As part of a broader business strategy to improve energy efficiency, Glatfelter will be implementing an alternative approach that will achieve greater emission reductions than the 90 percent SO2 removal projected under traditional BART. This approach includes installing control technology sufficient to achieve greater than BART SO2 removal on boiler numbers B002 and B003 or permanently shutting down the boiler(s).

8.4 Projected Emissions Reductions Resulting from Installation of BART Controls

The application of alternative BART to the subject-to-BART source, Glatfelter, will provide an estimated reduction of 20,515 TPY of SO2 emissions below current levels. Controlling both boilers at 90 percent would have resulted in limiting SO2 emissions to 24,931 pounds per day. Under this alternative the boilers will be limited to emitting 24,930 pounds per day. There is also the co-benefit of additional reductions of NOx and PM2.5 if Glatfelter chooses to permanently shut down a boiler.

8.5 Enforceability of BART Requirements

This requirement has been incorporated into a federally enforceable permit with a compliance date of December 31, 2014[12]. (Appendix H[13])

Under the alternative, control may include an add-on control device, use of an alternative fuel, use of low sulfur fuel, or a combination of these measures. In addition, Glatfelter may choose to shut down the boiler(s). By no later than December 31, 2013, Glatfelter shall submit to Ohio EPA an application for modification of the federally enforceable permit that includes a compliance plan outlining, at a minimum, the specific, selected control technologies and methods of compliance; and these requirements, along with any appropriate monitoring, recordkeeping, and reporting requirements, shall be incorporated into the federally enforceable permit by no later than December 31, 2014. A continuous emission monitoring system (CEMS) will also be installed prior to December 31, 2014 to measure and record the daily SO2 emissions. The requirements will be incorporated into the facility's Title V operating permit according to Title V revision procedures.

8.6 Monitoring, Recordkeeping, and Reporting of BART Requirements

Monitoring, recordkeeping, and reporting requirements to ensure compliance with the terms and conditions of 40 CFR Part 51 Appendix Y are required for all units subject to BART. As discussed above, Ohio will be incorporating all necessary requirements into the federally enforceable permit to ensure compliance with BART.

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[12] All necessary emission reductions must take place during the period of the first long-term strategy (40 CFR 51.308(e)(2)(iii)).

[13] This permit contains all requirements, including those unrelated to BART, for these two boilers. Incorporating this permit as an appendix to this SIP is not a request to incorporate all of the permit requirements into Ohio's SIP. Rather, Ohio EPA recognizes only the BART requirements are a part of this SIP.

9. Areas of Influence

Data source: Midwest Regional Planning Organization (MRPO) and Lake Michigan Air Directors Consortium (LADCO): Draft List of Class I Areas Located Within (or Impacted by) Midwest RPO States, June 26, 2007. (TSD (Appendix B))

Each state with a Class I area is required by 40 CFR 51.308(d) to address regional haze in each mandatory Class I federal area located within the state and in each mandatory Class I federal area located outside the state which may be affected by emissions from within the state. Although there are no Class I areas located within Ohio, the state is still required to address regional haze by determining any Class I area(s) that may be impacted by emissions from sources within Ohio.

Technical analyses conducted by the RPOs were consulted to obtain information on Ohio's areas of influence and culpability for Class I areas in the eastern U.S.[14] A summary of Class I areas determined to be impacted by Ohio is provided in the table below. An explanation of the assessments used to determine Ohio's areas of influence follows the table.

List of Class I Areas Assessed and Determined to be Impacted by Ohio

Class I Area Name	Impacted?	Class I Area Name	Impacted?
81.401 Alabama.		81.419 New Hampshire.	
Sipsey Wilderness Area	No	Great Gulf Wilderness Area	Yes: (1), (3)
81.404 Arkansas.		Pres. Range-Dry River Wilderness Area.	Yes: (1), (3)
Caney Creek Wilderness Area	Yes: (2), (4)	81.42 New Jersey.	
Upper Buffalo Wilderness Area	Yes: (2), (4)	Brigantine Wilderness Area	Yes: (1), (3)
81.408 Georgia.		81.422 North Carolina.	
Cohotta Wilderness Area	No	Great Smoky Mountains NP{1}	Yes: (1)
Okefenokee Wilderness Area	No	Joyce Kilmer-Slickrock Wilderness Area{2}	No

[14] Back trajectories and modeling conducted by the WRAP indicate that the MRPO States are not important contributors to visibility impairment due to sulfates and nitrates in western Class I areas (Cite: "Attribution of Haze Phase I Report, Geographic Attribution for the Implementation of the Regional Haze Rule", March 14, 2005). The analyses show only five groups of western Class I areas with at least 5 percent contribution from states outside the WRAP. The outside-WRAP contribution is generally small (on the order of 0-15 percent), and is likely due mostly to nearby CENRAP states.

Class I Area Name	Impacted?	Class I Area Name	Impacted?
Wolf Island Wilderness Area	No	Linville Gorge Wilderness Area.	No
81.411 Kentucky.		Shining Rock Wilderness Area.	No
Mammoth Cave NP	Yes: (1), (2), (5)	Swanquarter Wilderness Area	No
81.412 Louisiana.		81.426 South Carolina.	
Breton Wilderness Area	No	Cape Romain Wilderness	No
81.413 Maine.		81.428 Tennessee.	
Acadia National Park	Yes: (3)	Great Smoky Mountains NP{1}.	Yes: (1)
Moosehorn Wilderness Area.	Yes: (3)	Joyce Kilmer-Slickrock Wilderness{2}	No
81.414 Michigan.		81.431 Vermont.	
Isle Royale NP.	No	Lye Brook Wilderness	Yes: (1), (2), (3)
Seney Wilderness Area	Yes: (1), (2)	81.433 Virginia.	
81.415 Minnesota.		James River Face Wilderness.	Yes: (2), (5)
Boundary Waters Canoe Area Wilderness	No	Shenandoah NP	Yes: (1),(2),(3),(5)
Voyageurs NP	No	81.435 West Virginia.	
81.416 Missouri.		Dolly Sods/Otter Creek Wilderness.	Yes: (1),(2),(3),(5)
Hercules-Glades Wilderness Area	Yes: (2), (4)		
Mingo Wilderness Area	Yes: (2), (4)		

Key: (1) MRPO Back Trajectory Analyses, (2) MRPO PSAT Modeling, (3) MANE-VU Contribution Assessment, (4) Missouri-Arkansas Contribution Assessment, (5) VISTAS Areas of Influence

For the MRPO analyses, Ohio was assumed to affect visibility impairment in a Class I area if it contributes 2 percent (or more) to total light extinction. This criterion was selected based on a review of the back trajectory and modeling results which showed that states contributing 2 percent (or more) make up about 90 to 95 percent of total light extinction, whereas states contributing 5 percent (or more) make up about 75-80 percent of total light extinction. For the other RPO analyses, deference was given to the criteria established by each group to identify contributing states.

9.1 MRPO Back Trajectory Analyses

An initial trajectory analysis[15] was conducted using data for 1997-2001 (all sampling days), a start height of 200 meters, and a 72-hour (3-day) trajectory period. By combining trajectory frequencies with concentration information, the average contribution to PM2.5 mass and individual PM2.5 species was estimated (which, in turn, was used to estimate the average contribution to light extinction). The results for 17 Class I areas in eastern U.S. were examined to identify those Class I areas where Ohio had at least a 2 percent contribution to total light extinction (based on all days). Additional details on the back trajectory analyses are provided in the TSD (Appendix B).

9.2 MRPO Powertrain System Analysis Toolkit (PSAT) Modeling

A photochemical grid model (CAMx) was applied to provide source contribution information for 2018 conditions. Specifically, the model estimated the impact of 18 geographic source regions and 6 source sectors (EGU point, non-EGU point, on-road, off-road, area, and ammonia sources) at Class I areas in the eastern U.S. Example results for four Class I areas (Seney, Mammoth Cave, Mingo, and Shenandoah) are provided in the TSD (Appendix B). The results for 13 Class I areas in eastern U.S. were examined to identify those Class I areas where Ohio had at least a 2 percent contribution to total light extinction.

9.3 MANE-VU Contribution Assessment

A weight-of-evidence report[16] was prepared by the Northeast States for Coordinated Air Use Management (NESCAUM) (on behalf of MANE-VU) to understand the causes of sulfate-driven visibility impairment at Class I areas in the northeastern and mid-Atlantic portions of the U.S. The report provides information on the relative contribution of various emissions sources and geographic source regions. The analytical and assessment tools considered include Eulerian and Lagrangian air quality models, and data analysis techniques, such as source apportionment analyses, back trajectories, and examination of emissions and monitoring data. Sulfate impacts were quantified using five analytical techniques based on 2002 conditions: Regional Modeling System for Aerosols and Deposition (REMSAD), Q/D, CALPUFF (with National Weather Service data), CALPUFF (with MM5 data), and percent time upwind (based on trajectory analyses). Additional details, including the percent contribution results, for MANE-VU Class I areas is provided in the TSD (Appendix B).

Although no specific criteria were identified in the report to determine a significant contribution, the States of Vermont, New Hampshire, Maine, and New Jersey used a very low threshold of 2 percent sulfate contribution or 0.1 ug/m^3 sulfate contribution to

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[15] "Quantifying Transboundary Transport of PM2.5: A GIS Analysis", May 2003, LADCO
[16] "Contributions to Regional Haze in the Northeast and Mid-Atlantic United States", August 2006

the 20 percent worst days as their significance level. Ohio was an MRPO state identified as contributing to a MANE-VU Class I area.

9.4 Missouri-Arkansas Contribution Assessment

The draft Consultation Plan[17] for the two Missouri and two Arkansas Class I areas provides information on source regions affecting these Class I areas (i.e., areas of influence) using a variety of data and analyses. A decision on whether a given state is a contributor to visibility impairment in these Class I areas was based on the combined results of three approaches: areas of influence, PSAT modeling (based on 2018 conditions), and monitoring data analyses (Positive Matrix Factorization (PMF) and back trajectories). According to the draft plan, if a state was a major contributor for at least two of the three approaches (for either sulfate or nitrate), then it was determined to be a significant contributor. Ohio was an MRPO state identified as contributing to a central CENRAP Class I area. Additional details on this assessment are provided in the TSD (Appendix B).

9.5 VISTAS Area of Influence Analysis

Areas of influence were identified for Class I areas in the southeastern U.S. using residence time plots based on wind trajectory direction and frequency, and weighted by visibility impact (light extinction by ammonium sulfate, ammonium nitrate, or elemental carbon).[18]

These extinction-weighted residence time analyses were overlayed on gridded emissions (for both 2002 and 2018) to define emission sources in the areas of greatest influence for each Class I area. Areas of influence were defined on the basis of residence times greater than 10 percent. Ohio was an MRPO state identified as contributing to a VISTAS Class I area. Additional details on this assessment are provided in the TSD (Appendix B).

10. Long-Term Strategy and Reasonable Progress

Ohio evaluated each of the Class I areas identified under Section 9 as being impacted by emissions from Ohio sources. Information provided by MRPO, technical documents from the other RPOs, other states' Regional Haze SIPs or communications indicating their decisions regarding reasonable further progress goals were used as part of this evaluation.

Section 169A of the Clean Air Act and USEPA's visibility rule requires states to consider five factors:

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[17] "Central Class I Areas Consultation Plan", States of Missouri and Arkansas, February 2007
[18] "VISTAS Areas of Influence Analysis", Draft, February 28, 2007

- Costs of compliance;
- Time necessary for compliance;
- Energy and non-air quality environmental impacts of compliance;
- Remaining useful life of any existing source subject to such requirements; and
- Uniform rate of visibility improvement (needed to attain natural visibility conditions by 2064).

However, USEPA provides for flexibility in consideration of these factors:

> "…the factors could be used to select which sources or activities should or should not be regulated, or they could be used to determine the level or stringency of control, if any, for selected sources or activities, or some combination of both. The factors may be considered both individually and/or in combination. As noted in section 4.1, given the significant emissions reductions that we anticipate to result from BART, the CAIR, and the implementation of other CAA programs, these reductions may be all that is necessary to achieve reasonable progress in the first planning period for some states. Also, as noted in section 4.2, it is not necessary for you to reassess the reasonable progress factors for sources subject to BART for which you have already completed a BART analysis." (USEPA's "Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program," June 1, 2007)

In the following sections, these analyses are summarized. A detailed analysis of each area is included. In the previous section, MRPO modeling was used to identify areas possibly impacted by Ohio sources.

Ohio has no Class I areas and is not required to set reasonable progress goals. States with Class I areas lead the establishment of their reasonable progress goals and consideration of the factors above while Ohio participated in the discussions and provided information to assist in setting the goals.

Ohio is required by 40 CFR 51.308(d)(3) to submit a long-term strategy that addresses regional haze visibility impairment for each mandatory Class I area located outside Ohio that may be affected by emissions from within Ohio. The long-term strategy must include enforceable emissions limitations, compliance schedules and other measures necessary to achieve the reasonable progress goals established by states where the Class I areas are located.

In summary, Ohio believes that the current "on-the-books" controls address Ohio's impact on Class I areas and is therefore Ohio's long-term strategy. The "on-the-books" control programs include:

On-Highway Mobile Sources

- Federal Motor Vehicle Emission Control Program, low-sulfur gasoline and ultra-low sulfur diesel fuel
- Inspection - maintenance programs, including Ohio's E-check program in northeast Ohio (note: a special emissions modeling run was done for the Cincinnati/Dayton area to reflect the removal of the state's E-check program and inclusion of low RVP gasoline)

Off-Highway Mobile Sources

- Federal control programs (e.g., nonroad diesel rule), plus the evaporative Large Spark Ignition and Recreational Vehicle standards
- Heavy-duty diesel (2007) engine standard/Low sulfur fuel
- Federal railroad/locomotive standards
- Federal commercial marine vessel engine standards

Area Sources

- Consumer solvents
- AIM coatings
- Aerosol coatings
- Portable fuel containers

Power Plants

- Title IV (Phases I and II)
- NOx SIP Call
- Clean Air Interstate Rule, or its replacement

Other Point Sources

- VOC 2-, 4-, 7-, and 10-year MACT standards
- Combustion turbine MACT

One "on-the-book" control includes the CAIR. On March 10, 2005, the USEPA announced CAIR, a rule that addresses the interstate transport of air pollution to downwind states. On February 1, 2008, USEPA approved Ohio's CAIR program. Revisions to the CAIR SIP were again submitted by Ohio EPA on July 15, 2009. The revised CAIR SIP was approved as a direct final action on September 25, 2009 (74 FR 48857).

On July 11, 2008, the U.S. Court of Appeals for the D.C. Circuit vacated USEPA's CAIR rule. MRPO's modeling used as part of this submittal relied on EGU emission projections from USEPA's IPM3.0 analysis, which assumed implementation of Phases I and II of CAIR. MRPO conducted additional modeling where alternative EGU emission projections were developed, which did not rely on CAIR (or IPM). In summary, the results show, with respect to regional haze, there is a significant change from the previous MRPO modeling (with CAIR). The modeling shows higher visibility levels in 2018 for the 20 percent worst visibility days (average about 0.5 deciview for the northern Class I areas). The resulting visibility levels in the northern Class I areas (except Voyageurs) are above the glide path.

On December 23, 2008, the U.S. Court of Appeals for D.C. Circuit issued its mandate deciding to remand CAIR back to USEPA without vacatur. This decision allows implementation of CAIR, and the benefit of CAIR emission reductions, while USEPA works to address the Court's prior opinions contained in the original vacatur. To address the D.C. Circuit Court's concerns in the remand, USEPA proposed a replacement to the CAIR program, the Transport Rule on July 6, 2010. [75 FR 45210] Upon finalization, it will further assist states in addressing their obligations regarding regionally transported pollution by providing reductions in NOx and SO2 emissions in 2012 and 2014. Therefore, Ohio is basing its results with CAIR, or its replacement, in place.

Beyond "on-the-books" controls were considered. In summary:

- Controlling EGUs beyond CAIR control levels would have the most effect on visibility improvement. Beyond-CAIR controls are likely to be considered by Ohio and other states in the region when evaluating control options for meeting the new PM2.5 24-hour standard and the new 8-hour ozone standard. Such controls are likely to be implemented in a timeframe close to the 2018 haze progress date and will, therefore, result in additional improvements to visibility.

- Industrial, commercial and institutional (ICI) boiler controls are estimated to be a little more expensive per ton of SO2 or NOx removed than EGU controls and have much less overall impact on visibility improvement (in deciview) than EGUs. Ohio EPA worked with MRPO and the Northeast states to develop recommendations for a federal ICI boiler rule. Many states, including Ohio, have sent letters to USEPA requesting a cooperative effort between states and USEPA to reduce emissions from EGUs, ICI boilers, mobile sources and area sources (Appendix E).

- Requiring controls on other source sectors, such as reciprocating engines and turbines, and some mobile measures, may be cost effective, but they provide very little visibility improvement. Costs for mobile sources varied widely, but all programs had very little impact on visibility as discussed below.

- For agricultural sources, modeling is very uncertain and reducing ammonia may increase acid deposition, which could do more harm than the current visibility impacts.

With the current bleak economic condition in Ohio, pursuing controls on these other sectors for visibility reduction cannot be justified. Further, USEPA acknowledges that "in deciding what amount of emissions reduction is appropriate in setting the reasonable progress goals, you should take into account the fact that the long-term goal of no manmade impairment encompasses several planning periods. It is reasonable for you to defer reductions to later planning periods in order to maintain a consistent glidepath toward the long-term goal" (USEPA's "Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program," June 1, 2007). Notwithstanding the reasons described above for not pursuing additional controls, Ohio has pursued BART controls on the BART-eligible source(s) discussed in Section 8. Ohio does intend to revisit and review its decision during the progress review period and future planning periods.

The following subsections detail how Ohio meets the long-term strategy requirements.

10.1 Consultation

Ohio is required by 40 CFR 51.308(d)(3)(i) to consult with other states/tribes to develop coordinated emission strategies. This requirement applies both where emissions from the state are reasonably anticipated to contribute to visibility impairment in Class I areas outside the state and when emissions from other states/tribes are reasonably anticipated to contribute to visibility impairment in Class I areas within the state.

Ohio consulted with other states and tribes by participation in the MRPO and inter-RPO processes that developed technical information necessary for development of coordinated strategies (see Section 11).

Ohio received a letter from the MANE-VU on July 30, 2007 requesting a course of action for reasonable progress at their Class I areas. Ohio participated, along with other MRPO states, in consultations and discussions with MANE-VU and was provided a consultation summary by MANE-VU on August 6, 2007 (Appendix E). Ohio EPA provided a response on October 3, 2007 (Appendix E). In this response, Ohio requested additional information and work to be done before Ohio could properly respond to MANE-VU's request. MANE-VU's request is discussed in greater detail under Section 10.2.

The state coordination with FLMs on long-term strategy development is described in Section 3.

10.2 Share of Emissions Reductions

Ohio is required by 40 CFR 51.308(d)(3)(ii) to demonstrate that its implementation plan includes all measures necessary to obtain its fair share of emission reductions needed to meet reasonable progress goals.

In summary, Ohio has determined that its fair share of emission reductions needed to meet reasonable progress constitutes on-the-books controls. The following details Ohio's determination of its fair share of emission reductions for each Class I area which Ohio was determined to have emissions impacting visibility, as discussed under Section 9.

10.2.1 MRPO

Michigan - Seney Wilderness Area

Michigan identified states that are expected to contribute significantly to its Class I areas as those with more than a 5 percent contribution to visibility impairment. Ohio's contribution, as identified under Section 10.6.8, was found to be 4 percent and, therefore, Ohio was not identified by Michigan as a contributing state. Contributing states included: Michigan (18 percent), Illinois (14 percent), Indiana (12 percent) and Wisconsin (11 percent). Michigan determined that reasonable controls are on-the-books controls. Ohio supports Michigan's determination of reasonable progress for this first planning period for the Seney Wilderness Area and that on-the-book controls by Ohio constitutes Ohio's fair share of emission reductions.

10.2.2 MANE-VU

Four states in the MANE-VU region indicated that Ohio contributed to their Class I areas: Acadia and Moosehorn in Maine, Great Gulf/Presidential Range in New Hampshire, Brigantine in New Jersey, and Lye Brook in Vermont. MANE-VU used a very low threshold of two percent sulfate contribution or 0.1 ug/m^3 sulfate contribution to the 20 percent worst days in 2002 as their significance level.

The following summarizes the analysis by MRPO regarding Ohio's contribution to the MANE-VU Class I areas on the 20 percent worst visibility days for the first planning period (2018):

MANE-VU Class I Area	**% Contribution**
New Hampshire – Great Gulf Wilderness Area and Presidential Range-Dry River Wilderness Area	<2%
New Jersey – Brigantine Wilderness Area	3%
Vermont – Lye Brook Wilderness Area	3%
Maine – Acadia National Park	4%
Maine – Moosehorn Wilderness Area	<2%

MANE-VU's document entitled "Assessment of Reasonable Progress for Regional Haze in MANE-VU Class I Areas - Methodology for Source Selection, Evaluation of Control Options, and Four Factor Analysis, July 2007[19]" requests states outside of the MANE-VU area to examine controls for specific types of sources (i.e., "MANE-VU Ask"). MANE-VU suggested the following control strategies be adopted and implemented:

[19] http://www.marama.org/technical-center/regional-haze-planning/reasonable-progress-analysis, under "Work Products." The resulting request is referred to as the "MANE-VU Ask."

- Application of BART.

- 90 percent (or greater) reduction in SO2 emissions from each of the EGU stacks on MANE-VU's list of 167 stacks (located in 19 states), which reflect those stacks determined to be reasonably anticipated to cause or contribute to visibility impairment in the MANE-VU Class I areas.

- 28 percent reduction in non-EGU (point, area, on-road, and off-road) SO2 emissions relative to on-the-books, on-the-way 2018 projections.

- Continued evaluation of other measures, including measures to reduce SO2 and NO_x emissions from coal-burning facilities and promulgation of new source performance standards for wood combustion.

- Further reduction in power plant SO2 (and NOx) emissions beyond CAIR

Of the 167 stacks identified by MANE-VU based on 2002 emissions, 28 are from 14 sources in Ohio (Appendix E). Most of these stacks have or will have post-combustion emission controls for SO2 emissions (i.e., scrubbers). This will provide for further reductions in emissions from these Ohio sources compared to the 2002 emissions used by MANE-VU to develop this list.

Since 2002 the following sources from the MANE-VU list are implementing SO2 controls:

- The seven units (4 -185 MW; 300 MW; 2-600 MW) (identified as five stacks by MANE-VU) at First Energy W. H. Sammis facility began continuous operation of scrubbers in 2010.

- Two (600 MW each) of the three units at AEP Cardinal were operating scrubbers by the end of 2007 or early 2008. The third unit's (630 MW) scrubber is currently under construction but required by Consent Decree to continuously operate by 2012.

- AEP Muskingum currently has five units identified as two stacks by MANE-VU. The largest of five units (2-205 MW; 2-250 MW; 600 MW) at AEP Muskingum is required by Consent Decree to install and continuously operate a scrubber by 2016.

- The four units (573 MW each) at the Dayton P&L JM Stuart facility have installed and operated scrubbers continuously since spring of 2008.

- The unit (587 MW) at Dayton P&L Killen facility has installed and operated its scrubber since June 2007.

- In 2006, two of the units (each 125 MW) at AEP Conesville, and identified on MANE-VU's list, shut down (they comprised one stack). The second stack, comprised of one unit (800 MW), completed construction and began operating its scrubber in June 2009.

- Duke Miami Fort had five units in operation. In 2007, two of these units shut down. Of the remaining three units, two units (490 MW each) began operating scrubbers in 2007; and for the third (smallest at163 MW), Duke has indicated no immediate plans to install a scrubber.

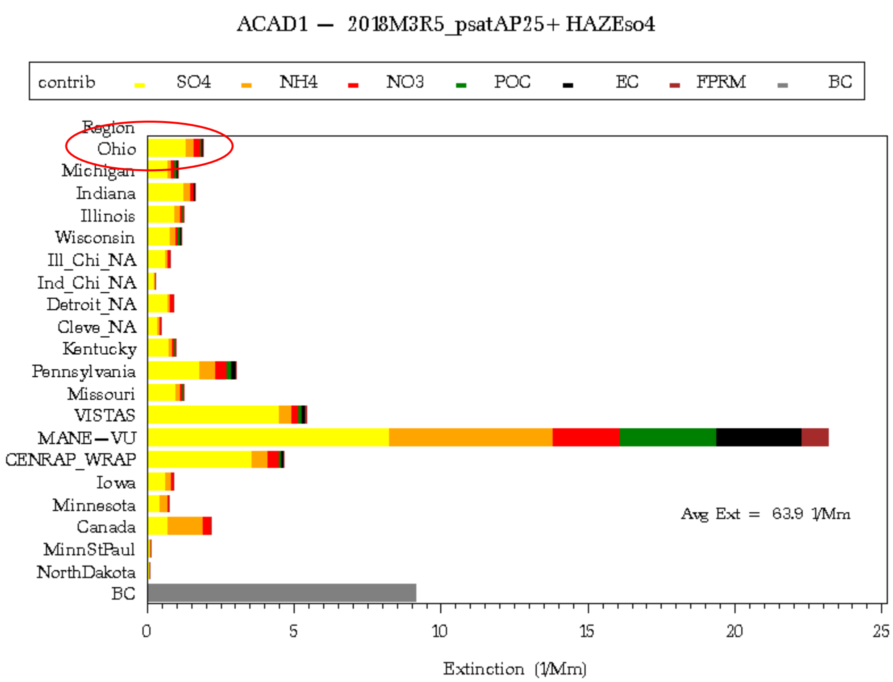
- First Energy Burger has three units. Two units (156 MW each) will shut down by no later than 2012. For the third (smallest at 94 MW), First Energy has indicated no immediate plans to install a scrubber.

- OVEC Kyger Creek has five units (217 MW each)(identified as one stack by MANE-VU). All units are planned to have scrubbers installed and operating by mid-2012.

Therefore, Ohio's utilities have made significant progress in installing SO2 controls as requested under MANE-VU's Ask.

The following chart from MRPO modeling shows the culpability of geographic areas to visibility conditions in the Arcadia Class I area for which MRPO modeling indicated Ohio as the highest contribution in 2018 compared to all Class I areas in the northeast for which Ohio is a contributor (circled in red):

Acadia Visibility Impact Modeling



The following table, based on MRPO modeling, identifies the percent contributions in 2018 from various states and regions to three Class I areas, including Arcadia, in the northeast:

2018	New Jersey	Vermont	Maine
	Brigantine	Lye Brook	Acadia
Canada	1%	2%	4%
MANEVU	41%	62%	44%
CENRAP_WRAP	3%	5%	9%
Ohio	3%	3%	4%
Michigan	1%	1%	2%
Indiana	2%	2%	3%
Illinois	1%	1%	2%
Wisconsin	1%	1%	2%
Kentucky	1%	1%	2%
IL_CHI_NA	1%	1%	2%
Detroit_NA	1%	1%	2%
IN_CHI_NA	0%	0%	1%
Clvlnd_NA	1%	1%	1%
Iowa	0%	0%	2%
VISTAS	22%	9%	10%
Minnesota	0%	0%	1%
Missouri	1%	1%	2%
Pennsylvania	18%	8%	6%
WestVirginia	3%	2%	2%
	100%	**100%**	**100%**

The chart and table demonstrate that Ohio sources have insignificant impacts on these areas compared to other states and regions.

More recent modeling has been done for MANE-VU (www.nescaum.org/topics/regional-haze/regional-haze-documents) for projecting visibility in 2018 ("2018 Visibility Projections," May 13, 2018). Based on this more recent modeling, MANE-VU found "the uniform rate is achieved and exceeded at all MANE-VU Class I sites."

The document further states:

> "MANE-VU received comments from several stakeholders and another RPO related to the fact that the modeling described in this report included control measures and emission reductions that went beyond currently existing regulations. Commenters suggested that since the CAIR program and other "on the books" or "on the way" measures are projected to achieve uniform rates of progress as previously modeled, additional reductions to both EGU and non-EGU sectors were unnecessary…. there are ..reasons why MANE-VU has chosen to include these measures in this modeling analysis….while the results of the modeling described in this report suggest individual MANE-VU Class I areas will be able to meet or exceed uniform rates of progress by 2018, our current analysis also suggests that this would be difficult without including additional measures beyond implementation of CAIR. This result is due, in part, to our assumptions about the effectiveness of CAIR. We believe that it is appropriate for MANE-VU to take a conservative approach to estimating the potential for emissions reductions under the CAIR program. Therefore MANE-VU added EGU emissions to estimate the impact of banking and trading under CAIR. Additional EGU reductions would be feasible with additional federal action to control EGU emissions (e.g., a third phase of CAIR), but MANE-VU does not believe that these reductions are likely to occur absent additional regulation."

MRPO used USEPA's approved IPM modeling and projections to project EGU emissions for 2018. Ohio EPA does not agree with MANE-VU's "add back" due to the uncertainty of CAIR.

Further details are found in MANE-VU's February 7, 2008 document entitled "MANE-VU Modeling for Reasonable Progress Goals" regarding the following projections for 2018:

Table 5-2. Projected 2018 twenty percent worst day deciview goals for MANE-VU Class I areas under various control assumptions

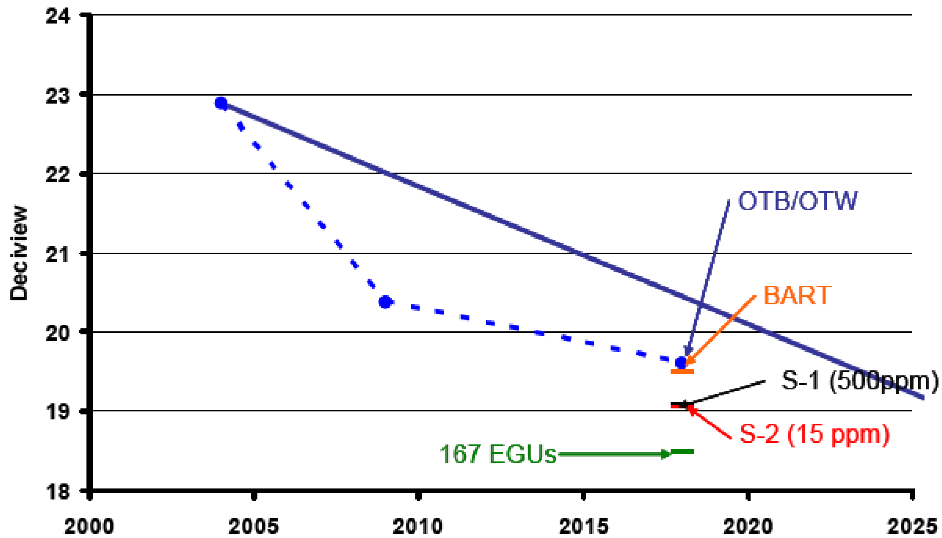
MANE-VU Class I Area	Baseline [2000-2004]	OTB/OTW [2018]	+BART	+S-1	+S-2	+167 EGUs
Acadia National Park, ME	22.89	19.62	19.51	19.10	19.05	18.50
Brigantine Wilderness, NJ	29.01	24.26	24.19	24.00	23.98	23.47
Great Gulf Wilderness, NH	22.82	18.81	18.74	18.62	18.61	18.43
Lye Brook Wilderness, VT	24.45	20.40	20.29	20.13	20.12	19.90
Moosehorn Wilderness, ME	21.72	18.59	18.50	18.20	18.16	17.80
Presidential Range – Dry River Wilderness, NH	22.82	18.98	18.90	18.78	18.77	18.59
Roosevelt-Campobello International Park, NB	21.72	18.58	18.49	18.19	18.15	17.79

Notes on Table 5-2:

1. Baseline values represent the 5-year average baseline conditions (dv) on the 20 percent worst days.
2. OTB/OTW represents the projected deciview goal due to all OTB/OTW measures.
3. Pluses indicate that the deciview goals assume implementation of all measures to the left of and including the column indicated.
4. BART reflects preliminary estimates of emissions reductions due to BART determinations. These determinations are still in the process of being conducted and thus are subject to change.
5. S-1 oil strategy assumes the adoption of 500 ppm distillate, 0.25 percent S for all No. 4 oil and 0.5 percent S for all No. 6 residual oil.
6. S-2 oil strategy assumes the adoption of 15 ppm distillate, 0.25 percent S for all No. 4 oil and 0.5 percent S for all No. 6 residual oil.
7. 167 EGU strategy benefits are based on net reductions after each of the 167 stacks is controlled to at least the 90 percent level and after the identified emissions reductions (beyond 2018 projections contained in the Base B emissions files) are redistributed among all other CAIR-eligible EGUs in the modeling domain.

As seen above, for Arcadia (the Class I area for which Ohio has the highest contribution in 2018 (4 percent)), a 4.39 deciview, or 19 percent, reduction is predicted based on on-the-book controls and restrictions on fuel sulfur content in the MANE-VU region. Adding additional controls incorporated into MANE-VU's Ask results in an additional 0.55 deciview, or 2 percent, change. Important to note, in all cases, including on-the-books control, the uniform rate of improvement is met at Arcadia as depicted graphically below in MANE-VU's document:

Figure 5-6. Visibility improvement relative to uniform rate of progress at Acadia National Park



The same results are seen in this document for all MANE-VU Class I areas.

Ohio EPA committed to continuing work with MANE-VU states but continues to believe that on-the-books controls, for this first planning period, represent reasonable progress. However, Ohio, along with the other MRPO states, has committed to continue consultation with MANE-VU. Specifically, Ohio has agreed to support additional work and discussion to accomplish the following:

Establish a clear understanding of the MANE-VU Ask by agreeing on base emissions inventories and control assumptions;
Draft language on a national "Ask" based on the multi-pollutant needs of the states, including potential controls for EGUs and ICI boilers; and
Reconvene the MANE-VU/MRPO ICI boiler workgroup (with participation by the Southeastern states and USEPA) to re-examine the workgroup's January 2007 straw proposal.

In addition, as discussed above, in 2009 after a six-month collaborative effort among MRPO and northeast states, many states, including Ohio and MANE-VU states, sent letters to USEPA requesting a cooperative effort between states and USEPA to reduce emissions from EGUs, ICI boilers, mobile sources and area sources (Appendix E).

If a contributing state cannot agree with the state establishing the reasonable progress goal, "the state setting the goal must describe the actions taken to resolve the disagreement." [64 FR 35714] Ohio does not believe at this time that it can commit to any particular course of action beyond the collaboration that occurred in 2009 until it is determined, through the above work and further discussions, what actions may be appropriate to meet reasonable progress goals given Ohio's marginal impact on those areas.

10.2.3 Missouri-Arkansas (CENRAP)

Arkansas- Caney Creek Wilderness Area and Upper Buffalo Wilderness Area

The CENRAP modeling shows that Arkansas's Class I areas can achieve the 2018 reasonable progress goals without additional control measures (above on-the-books).

For the two Arkansas Class I areas, 2018 visibility projections are available from the CENRAP, VISTAS and MRPO RPOs. MRPO projections showed Ohio's contribution at 3 percent for both of these Class I areas. However, the TSD[20] prepared by Environ for CENRAP states acknowledges "the MRPO 2018 visibility projections are approximately 12 to 25 percentage points lower than the CENRAP and VISTAS projections at these three Class I areas, with values of 97 percent to 100 percent. The reasons why the MRPO 2018 visibility projections are less optimistic than CENRAP and VISTAS are unclear. However, the MRPO focused on visibility projections at their northern Class I areas and likely did not use the latest CENRAP emission estimates. In addition, the CENRAP 2018 visibility projections included BART controls on several sources in CENRAP states not included in the MRPO projections. Such BART controls are even more important in those states not covered by CAIR."

Arkansas' Regional Haze SIP states that by 2018, Arkansas is the largest contributor to extinction at Caney Creek for the 20 percent worst days followed by East Texas, the large Eastern U.S. region and then secondary organic aerosols (SOA) due to biogenic sources. Ohio's contribution to the worst 20 percent days as identified in Arkansas' SIP is depicted below (circled in red):

[20] ENVIRON's "Technical Support Document for CENRAP Emissions and Air Quality Modeling to Support Regional Haze State Implementation Plans," September 12, 2007.

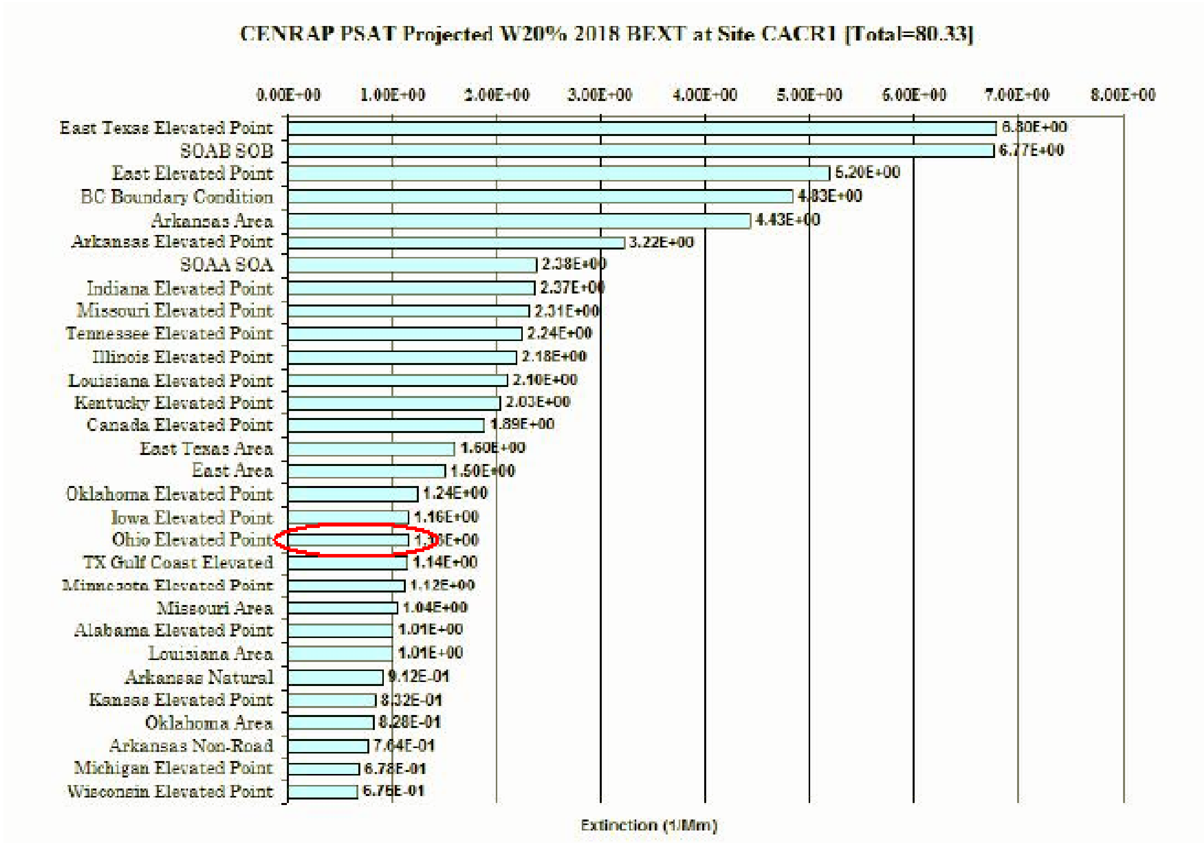


Figure E-1e. Ranked PSAT source region by source category contributions to the average 2018 extinction (Mm^{-1}) for the Worst 20% visibility days at Caney Creek (CACR), Arkansas

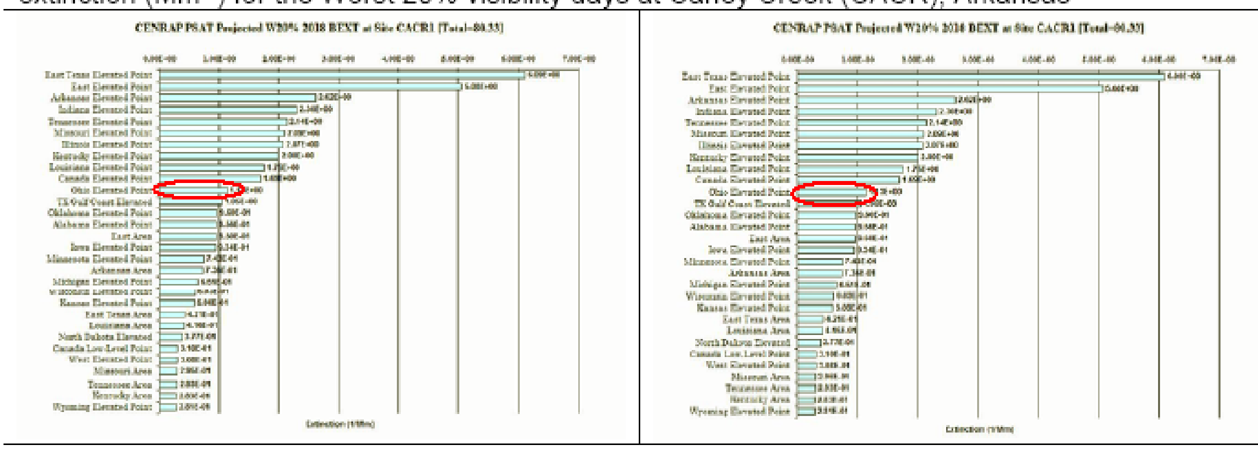


Figure E-1f. Ranked PSAT source region by source category contributions to the average 2018 SO4 (left) and NO3 (right) extinction (Mm^{-1}) for the Worst 20% visibility days at Caney Creek (CACR), Arkansas

And:

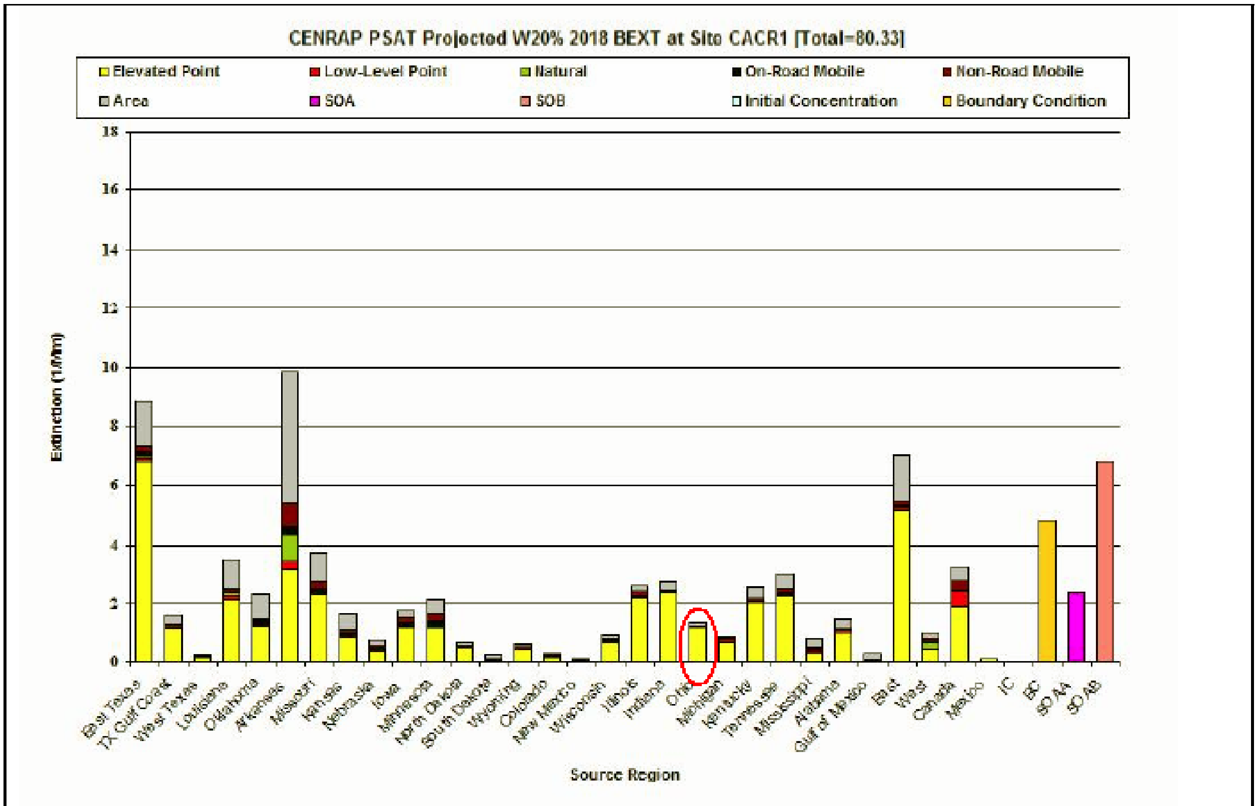


Figure E-1d. PSAT source region by source category contributions to the average 2018 extinction (Mm^{-1}) for the Worst 20% visibility days at Caney Creek (CACR), Arkansas.

Arkansas' SIP states the contributions to extinction on the worst 20 percent days at Upper Buffalo is similar to Caney Creek only with less contributions from East Texas and more from Missouri, Illinois and Indiana. Ohio's contribution to the worst 20 percent days as identified in Arkansas' SIP is depicted below (circled in red):

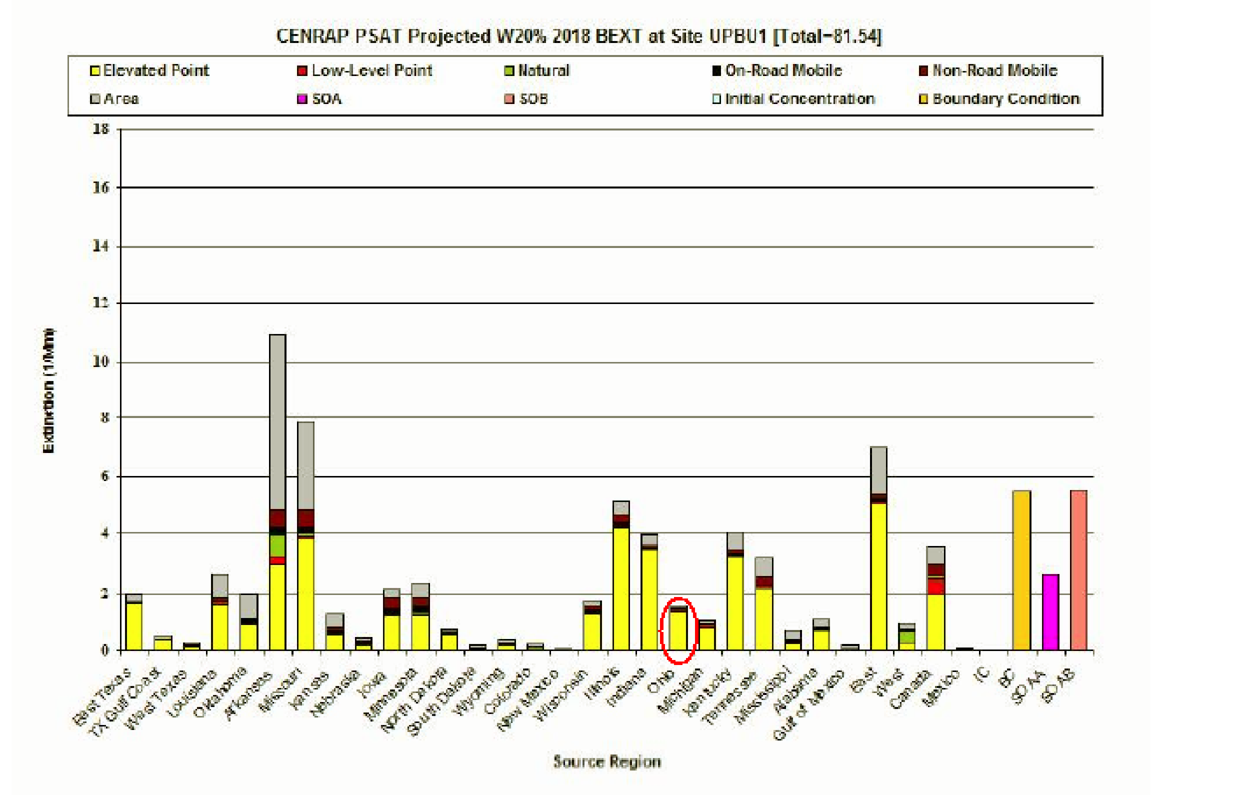


Figure E-2d. PSAT source region by source category contributions to the average 2018 extinction (Mm^{-1}) for the Worst 20% visibility days at Upper Buffalo (UPBU), Arkansas.

And:

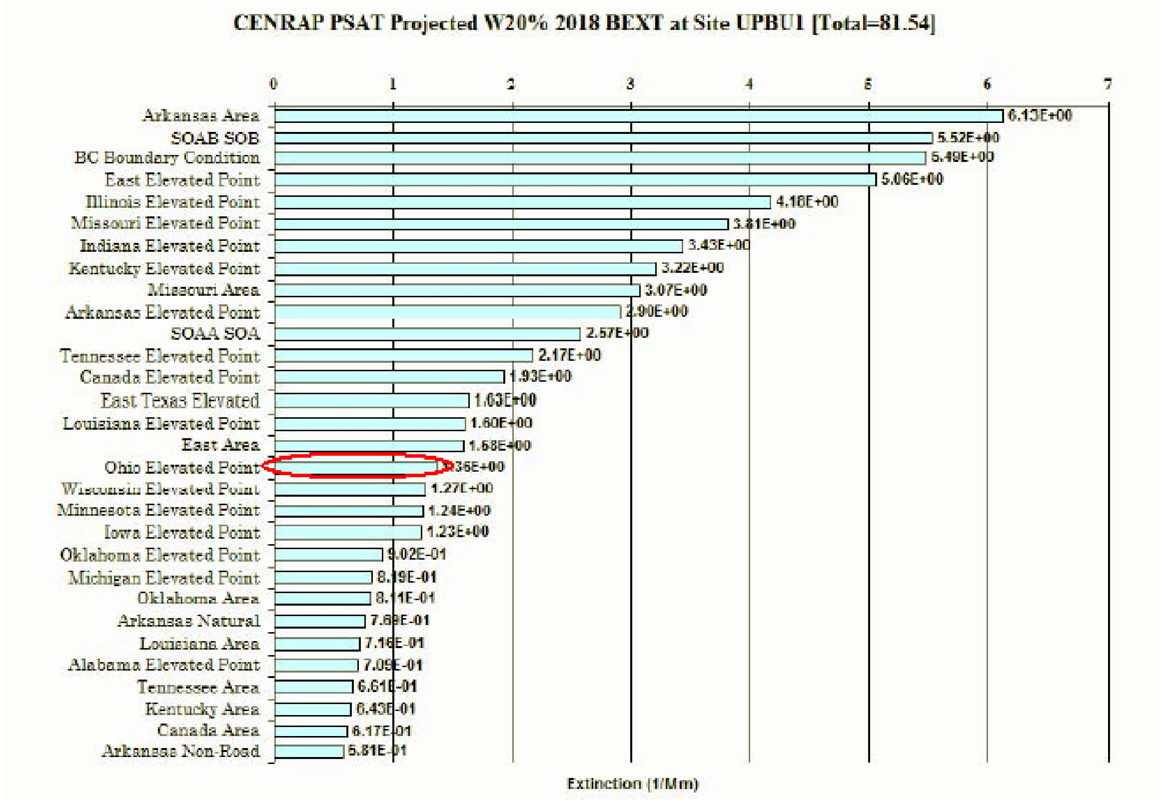


Figure E-2e. Ranked PSAT source region by source category contributions to the average 2018 extinction (Mm^{-1}) for the Worst 20% visibility days at Upper Buffalo (UPBU), Arkansas.

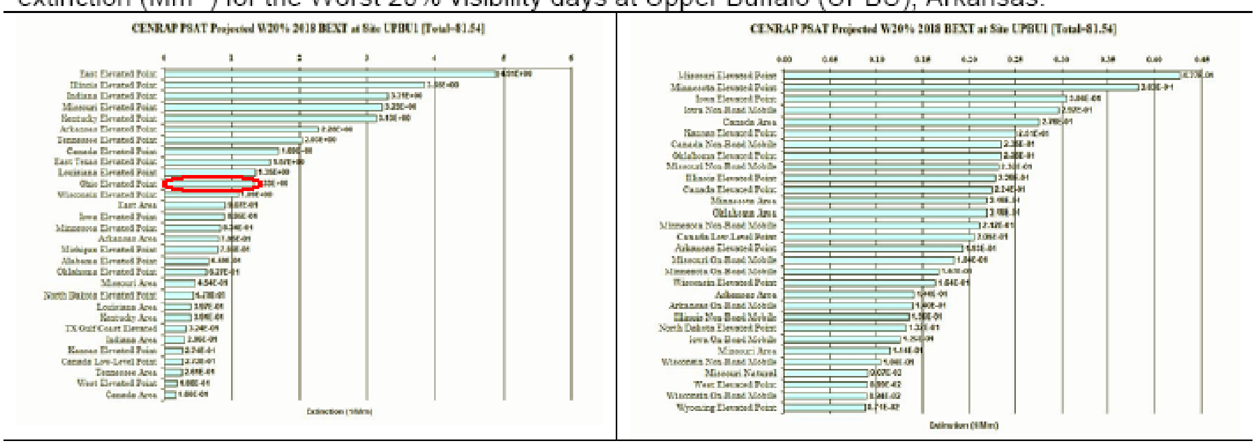


Figure E-2f. Ranked PSAT source region by source category contributions to the average 2018 SO4 (left) and NO3 (right) extinction (Mm^{-1}) for the Worst 20% visibility days at Upper Buffalo (UPBU), Arkansas.

**note: Ohio is not identified as a contributor for NO3 in the right graph.*

Arkansas' SIP demonstrates that on-the-books controls are sufficient to meet the uniform rate of progress needed during this first planning period (2018), as depicted in the glide paths below:

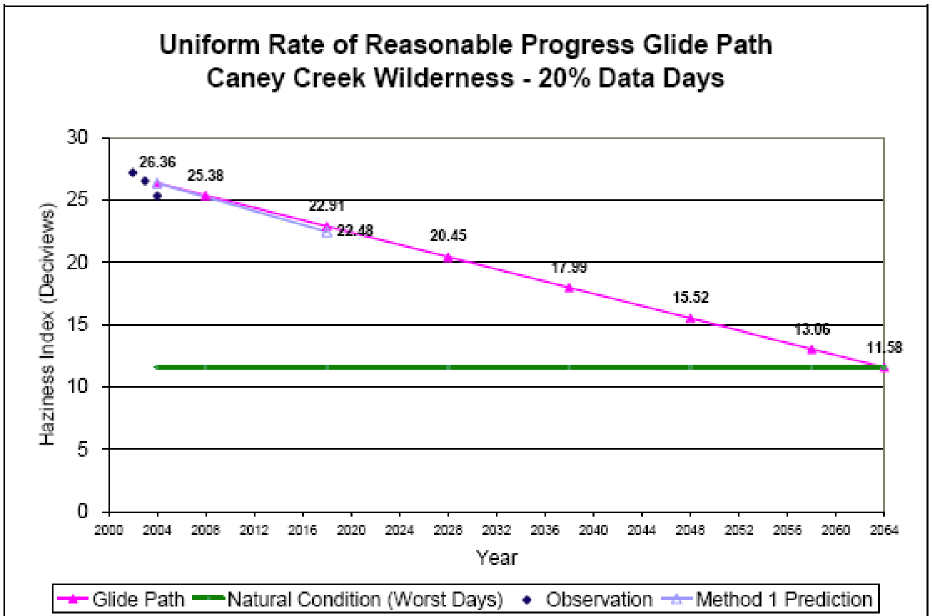


Figure D-1a. 2018 Visibility Projections and 2018 URP Glidepaths in deciview for Caney Creek (CACR), Arkansas and Worst 20% (W20%) days using 2002/2018 Base G CMAQ 36 km modeling results.

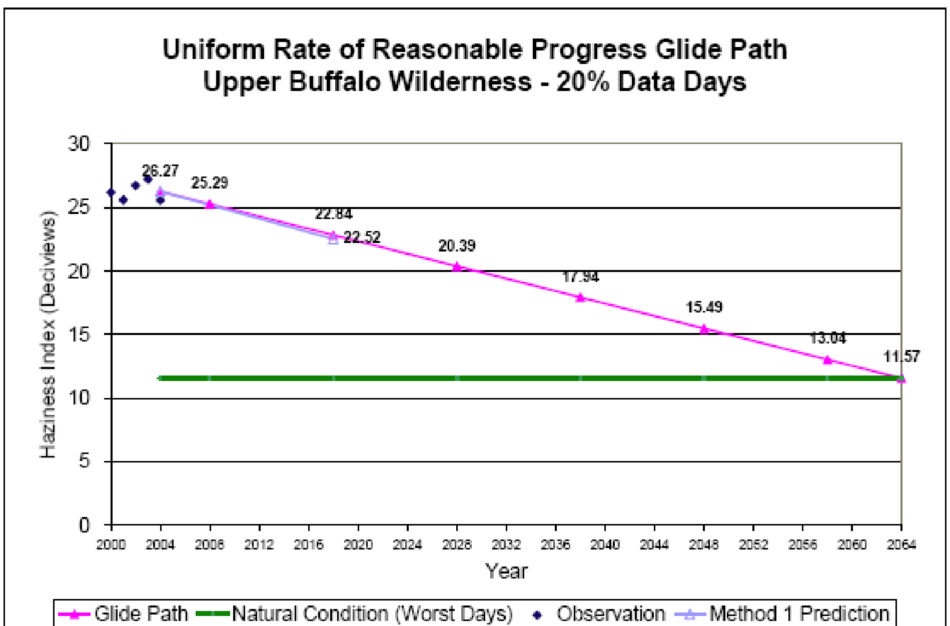


Figure D-2a. 2018 Visibility Projections and 2018 URP Glidepaths in deciview for Upper Buffalo (UPBU), Arkansas and Worst 20% (W20%) days using 2002/2018 Base G CMAQ 36 km modeling results.

Ohio supports Arkansas' determination of reasonable progress for this first planning period for the two Class I areas and that on-the-book controls by Ohio constitutes Ohio's fair share of emission reductions.

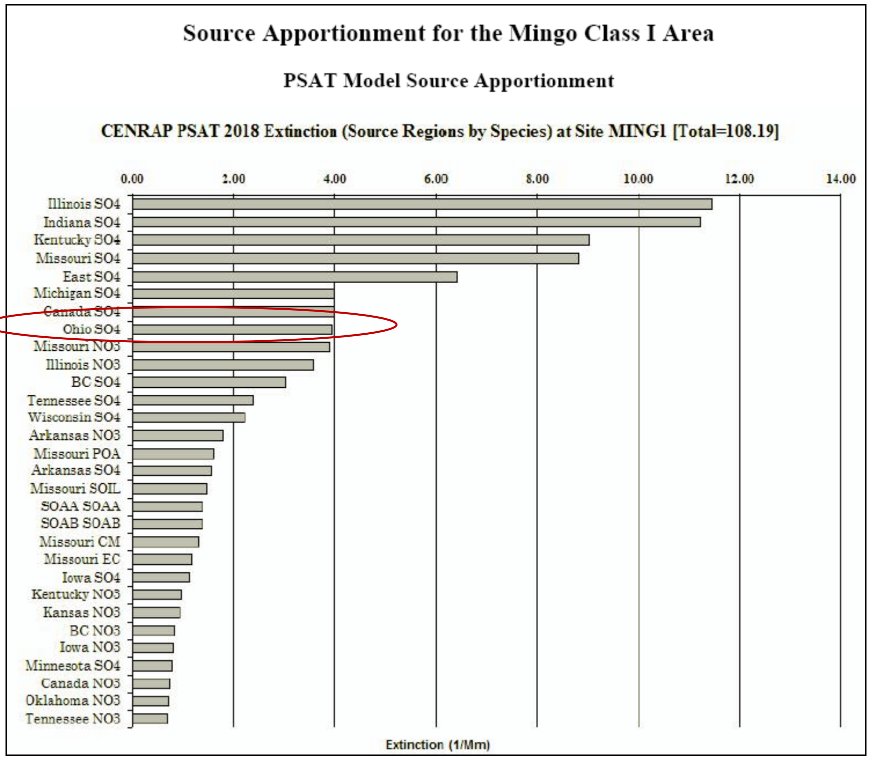
Missouri – Hercules-Glades Wilderness Area and Mingo Wilderness Area

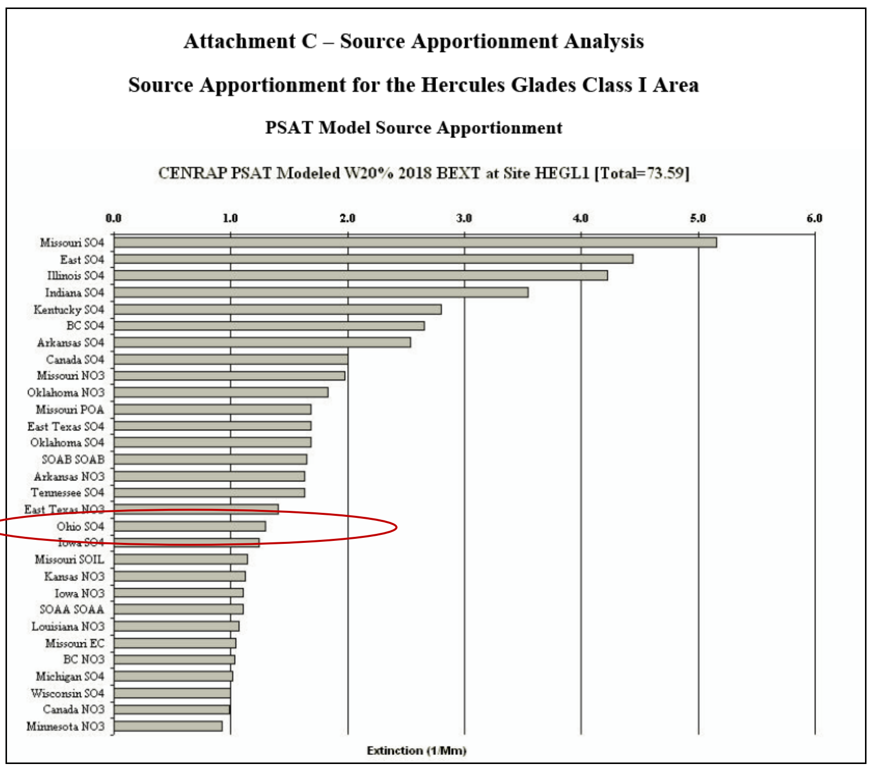
For the two Missouri Class I areas, 2018 visibility projections are available from the CENRAP, VISTAS and MRPO RPOs. MRPO projections showed Ohio's contribution at 6 percent for Mingo and 4 percent for Hercules-Glades. However, the TSD[21] prepared by Environ for CENRAP states acknowledges "the MRPO 2018 visibility projections are approximately 12 to 25 percentage points lower than the CENRAP and VISTAS projections at these three Class I areas, with values of 97 percent to 100 percent. The reasons why the MRPO 2018 visibility projections are less optimistic than CENRAP and VISTAS are unclear. However, the MRPO focused on visibility projections at their northern Class I areas and likely did not use the latest CENRAP emission estimates. In addition, the CENRAP 2018 visibility projections included BART controls on several sources in CENRAP states not included in the MRPO projections. Such BART controls are even more important in those states not covered by CAIR."

Missouri states in their Regional Haze SIP that nine states, including Missouri, Arkansas, Kentucky, Illinois, Indiana, Ohio, Oklahoma, Tennessee and Texas, were identified as contributing to visibility in Mingo and/or Hercules Glades Class I areas. Missouri's SIP states the modeling demonstration has shown that the emission reductions from these contributing states are sufficient to achieve reasonable progress goals in Missouri's Class I areas. They also state that "ongoing air pollution control programs … are sufficient to meet the 2018 Uniform Rate of Progress for the Mingo and Hercules Glades Class I areas. These ongoing programs such as CAIR, BACT, or BART have been demonstrated to be very cost-effective in reducing the visibility in Missouri's Class I areas."

Appendix E of Missouri's SIP identifies Ohio contributing to Mingo and Hercules Glades with respect to sulfate but not nitrate.

[21] ENVIRON's "Technical Support Document for CENRAP Emissions and Air Quality Modeling to Support Regional Haze State Implementation Plans," September 12, 2007.





Missouri is the largest contributor as demonstrated above and Missouri states in its SIP that existing programs are sufficient for its state and the other contributing states. As further support, the largest contributions from Ohio for SO2 are identified in its SIP as: Conesville, Cinergy Beckjord and Killen. As stated above, two of these three facilities have already installed SO2 controls.

Missouri's SIP demonstrates that on-the-books controls are sufficient to meet the uniform rate of progress needed during this first planning period (2018), as depicted in the glide paths below:

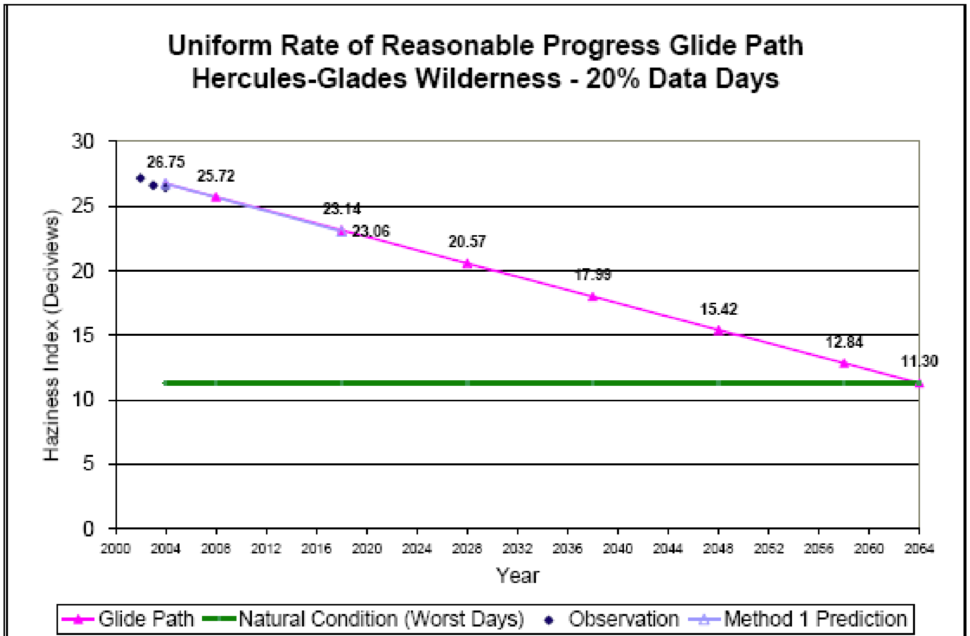


Figure D-6a. 2018 Visibility Projections and 2018 URP Glidepaths in deciview for Hercules-Glade (HEGL), Missouri and Worst 20% (W20%) days using 2002/2018 Base G CMAQ 36 km modeling results.

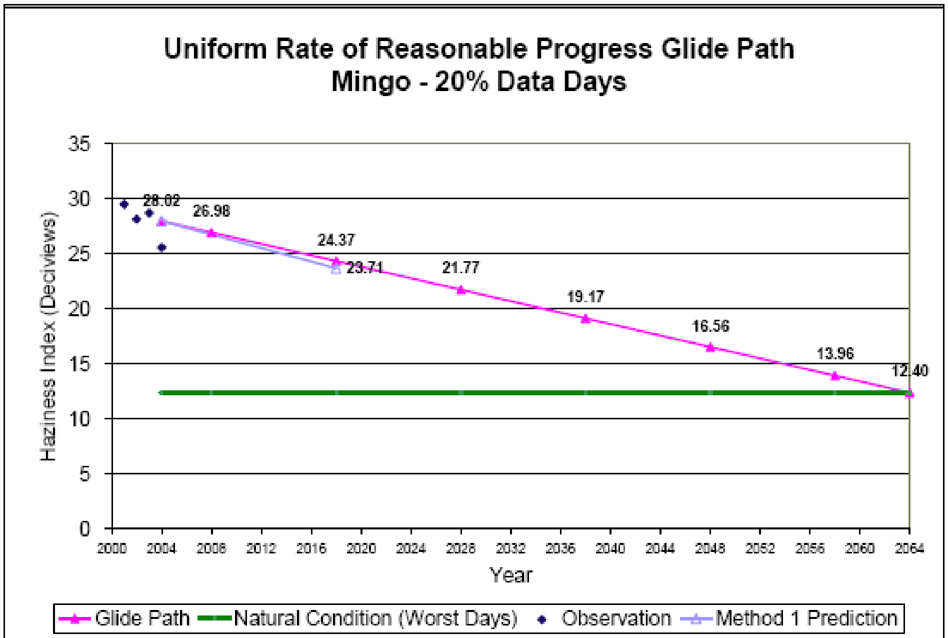


Figure D-7a. 2018 Visibility Projections and 2018 URP Glidepaths in deciview for Mingo (MING), Missouri and Worst 20% (W20%) days using 2002/2018 Base G CMAQ 36 km modeling results.

Missouri's SIP, as stated above, determined the "emission reductions from these contributing states are sufficient to achieve reasonable progress goals in Missouri's Class I areas." Ohio supports Missouri's determination of reasonable progress for this first planning period for the two Class I areas and that on-the-book controls by Ohio constitutes Ohio's fair share of emission reductions.

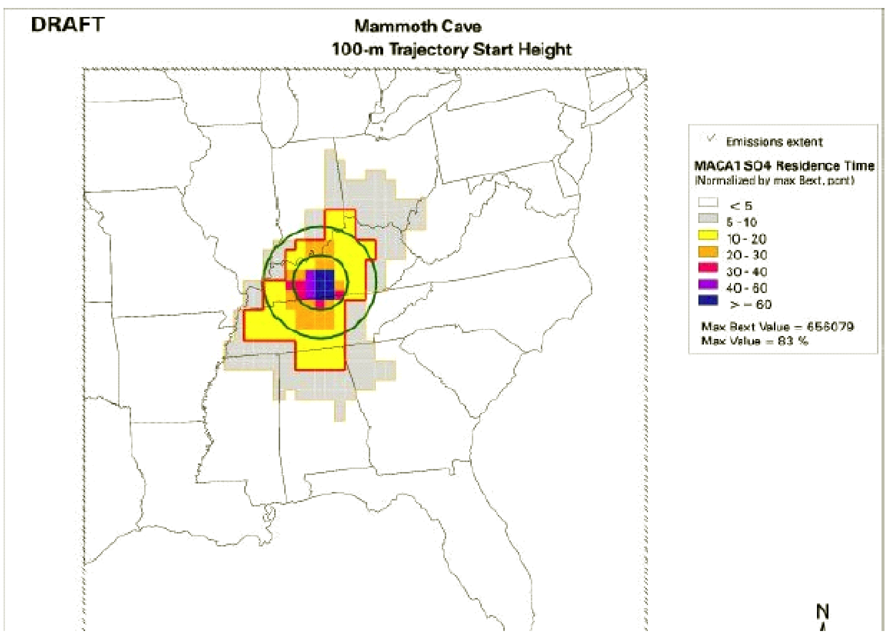
10.2.4 VISTAS

Ohio was an MRPO state identified as contributing to a VISTAS Class I area.

Kentucky – Mammoth Cave National Park

Kentucky identified states that are expected to contribute to its Class I areas as those in an area of influence defined by 5 percent or greater sulfate extinction-weighted residence time. The following depicts Mammoth Cave's area of influence:

SO2 Area of Influence for Mammoth Cave, KY



Green circles indicate 100-km and 200-km radii from Class I area.
Red line perimeter indicate Area of Influence with Residence Time ≥ 10%
Orange line perimeter indicate Area of Influence with Residence Time ≥ 5%.

Ohio's contribution, as analyzed by MRPO and identified under Section 10.6.8, was found to be 8 percent. Kentucky's Regional Haze SIP identifies Ohio's percent contribution to SO2 emissions at 4 percent. More significant contributing states identified by Kentucky included: Kentucky (54 percent), Indiana (22 percent) and Tennessee (13 percent). Kentucky determined the VISTAS baseline modeling demonstrated that the 2018 base control scenario (existing and planned (i.e., on-the-books)) provides for an improvement in visibility better than the uniform rate of progress for Mammoth Cave for the most impaired days over the first planning period and ensures no degradation in visibility for the least impaired days over the same period, as depicted in the glide path below:

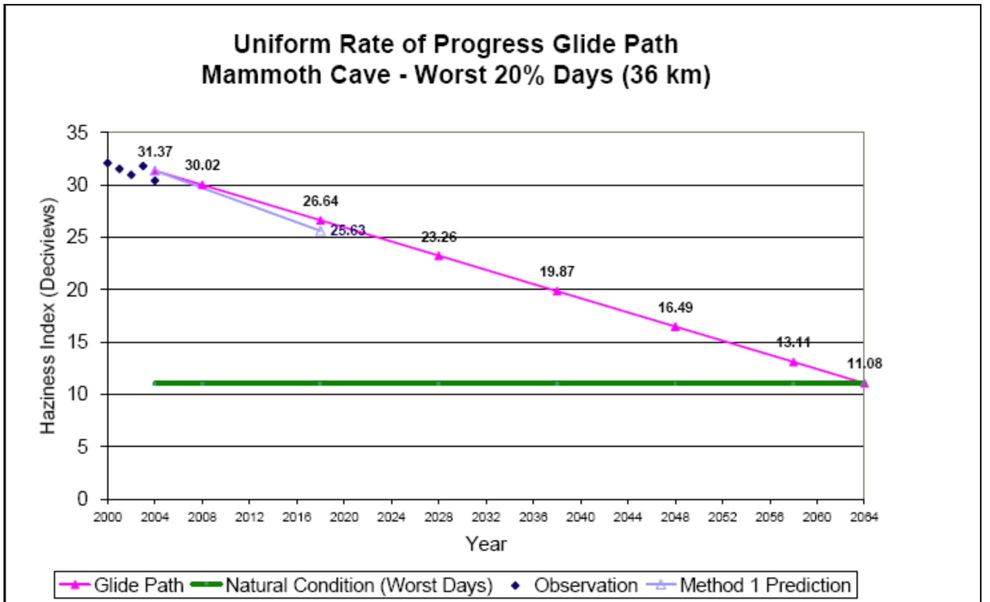
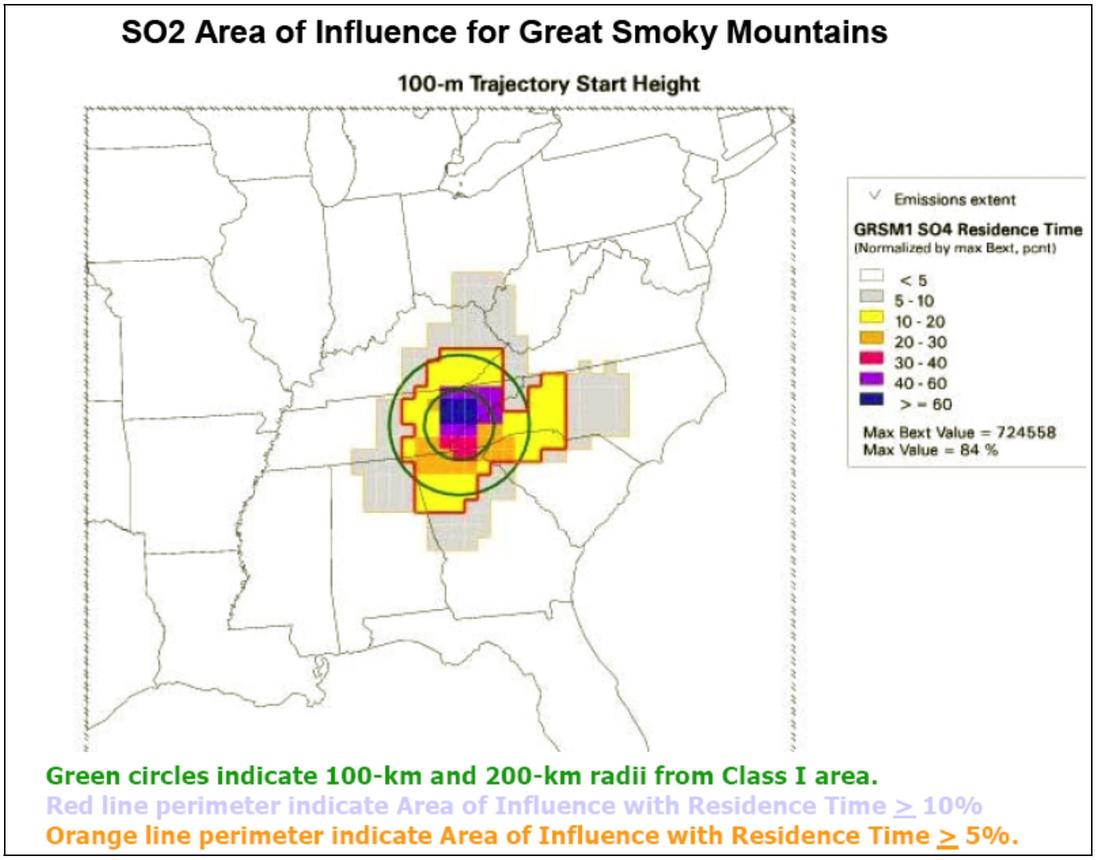


Figure E-7b. 2018 Visibility Projections and 2018 URP Glidepath in deciview for Mammoth Cave (MACA), Kentucky and Worst 20% (W20%) days using 2002/2018 Base G2 CMAQ 36 km modeling results.

Ohio supports Kentucky's determination of reasonable progress for this first planning period for Mammoth Cave and that on-the-book controls by Ohio constitutes Ohio's fair share of emission reductions.

<u>North Carolina and Tennessee– Great Smoky Mountains National Park</u>

North Carolina and Tennessee identified states that are expected to contribute to their Class I areas as those in an area of influence defined by 5 percent or greater sulfate extinction-weighted residence time. The following depicts Great Smoky Mountain's area of influence:



Ohio's contribution, as analyzed by MRPO, was found to be less than 2 percent; however, MRPO back trajectory analysis did determine Ohio was a contributor. Tennessee and North Carolina's Regional Haze SIPs identifies Ohio's percent contribution to SO2 emissions at 0.9 percent. More significant contributing states identified by North Carolina and Tennessee included: Tennessee (75 percent), Georgia (8 percent) and North Carolina (7 percent). North Carolina and Tennessee determined the VISTAS baseline modeling demonstrated that the 2018 base control scenario (on-the-books) provides for an improvement in visibility better than the uniform rate of progress for Great Smoky Mountains for the most impaired days over the first planning period and ensures no degradation in visibility for the least impaired days over the same period, as depicted in the glide path below:

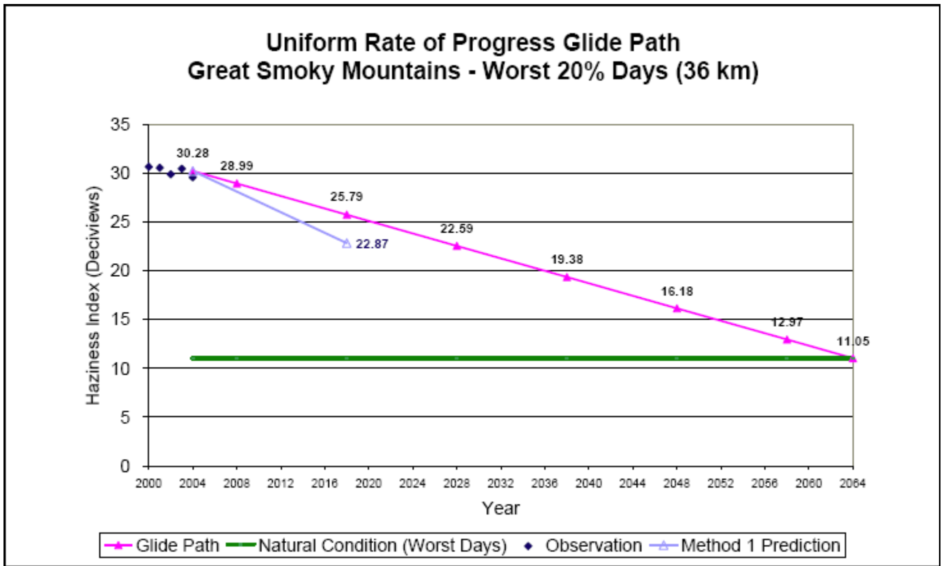


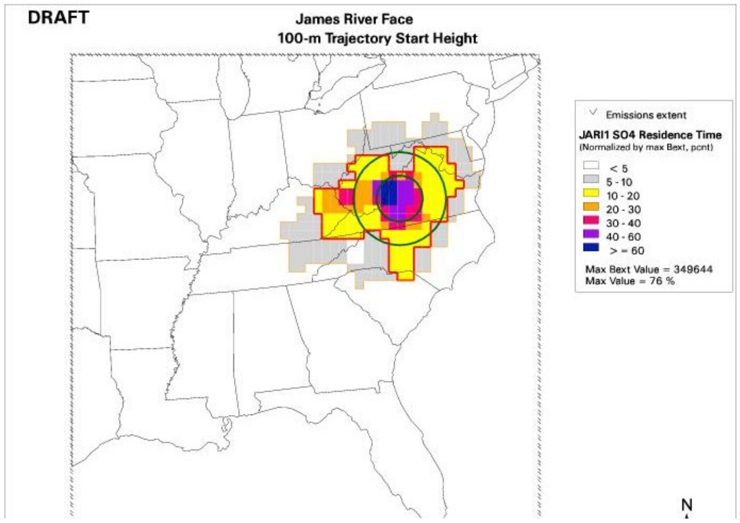
Figure E-12b. 2018 Visibility Projections and 2018 URP Glidepath in deciview for Great Smoky Mountains (GRSM), Tennessee-North Carolina and Worst 20% (W20%) days using 2002/2018 Base G2 CMAQ 36 km modeling results..

Ohio supports Tennessee and North Carolina's determination of reasonable progress for this first planning period for Great Smoky Mountains and that on-the-book controls by Ohio constitutes Ohio's fair share of emission reductions.

<u>Virginia – James River Face Wilderness Area and Shenandoah National Park</u>

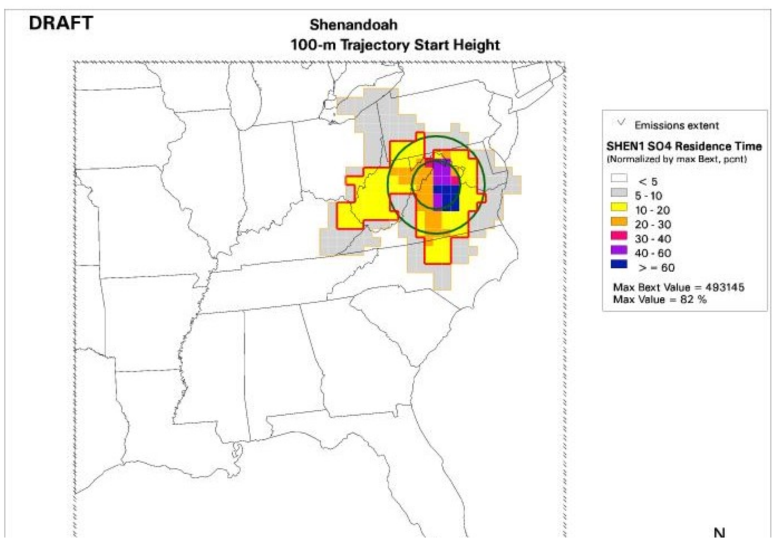
Virginia identified states that are expected to contribute to its Class I areas as those in an area of influence defined by 5 percent or greater sulfate extinction-weighted residence time. The following depicts Virginia's Class I area's area of influence:

SO2 Area of Influence for James River Face, VA



Green circles indicate 100-km and 200-km radii from Class I area.
Red line perimeter indicate Area of Influence with Residence Time ≥ 10%
Orange line perimeter indicate Area of Influence with Residence Time ≥ 5%.

SO2 Area of Influence for Shenandoah, VA



Green circles indicate 100-km and 200-km radii from Class I area.
Red line perimeter indicate Area of Influence with Residence Time ≥ 10%
Orange line perimeter indicate Area of Influence with Residence Time ≥ 5%.

Ohio's contribution, as analyzed by MRPO and identified under Section 10.6.8, was found to be 9 percent at James River and 8 percent at Shenandoah. Virginia's Regional Haze SIP identifies Ohio's percent contribution to SO2 emissions at 3.6 percent at James River and 4.6 percent at Shenandoah. More significant contributing states identified by Virginia for James River included: Virginia (62 percent), West Virginia (15 percent) and North Carolina (9 percent). More significant contributing states identified by Virginia for Shenandoah included: Virginia (38 percent), Maryland (24 percent), and West Virginia (20 percent).

Virginia's Regional Haze SIP identified specific sources (units) in other states calculated to have at least a 1 percent calculated impact on James River Face and Shenandoah. No Ohio sources (units) were identified on the list.

Virginia determined the VISTAS baseline modeling demonstrated that the 2018 base control scenario (on-the-books) provides for an improvement in visibility better than the uniform rate of progress for Virginia's Class I areas for the most impaired days over the first planning period and ensures no degradation in visibility for the least impaired days over the same period, as depicted in the glide path below:

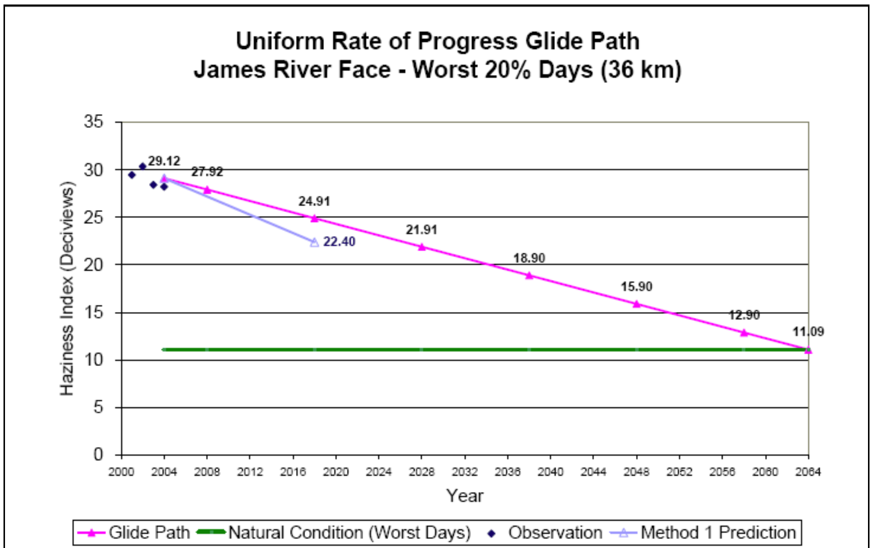


Figure E-13b. 2018 Visibility Projections and 2018 URP Glidepath in deciview for James River Face (JARI), Virginia and Worst 20% (W20%) days using 2002/2018 Base G2 CMAQ 36 km modeling results.

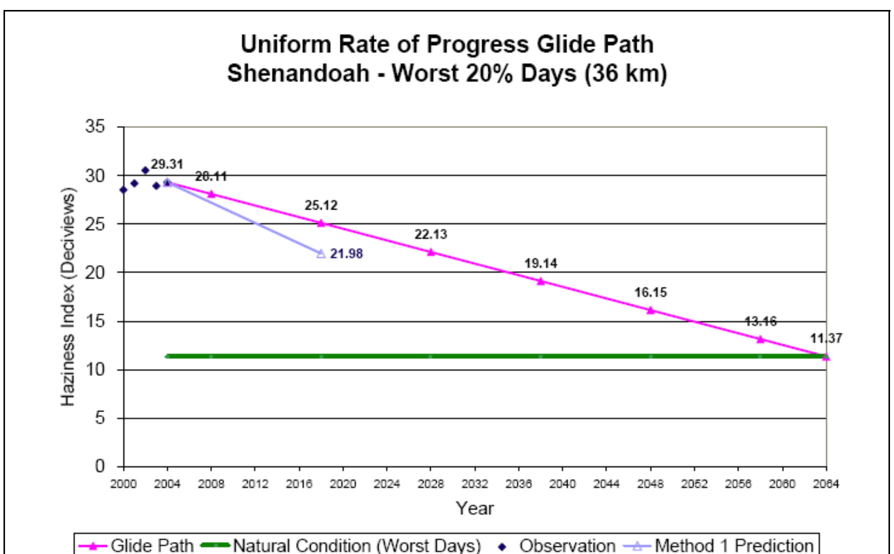
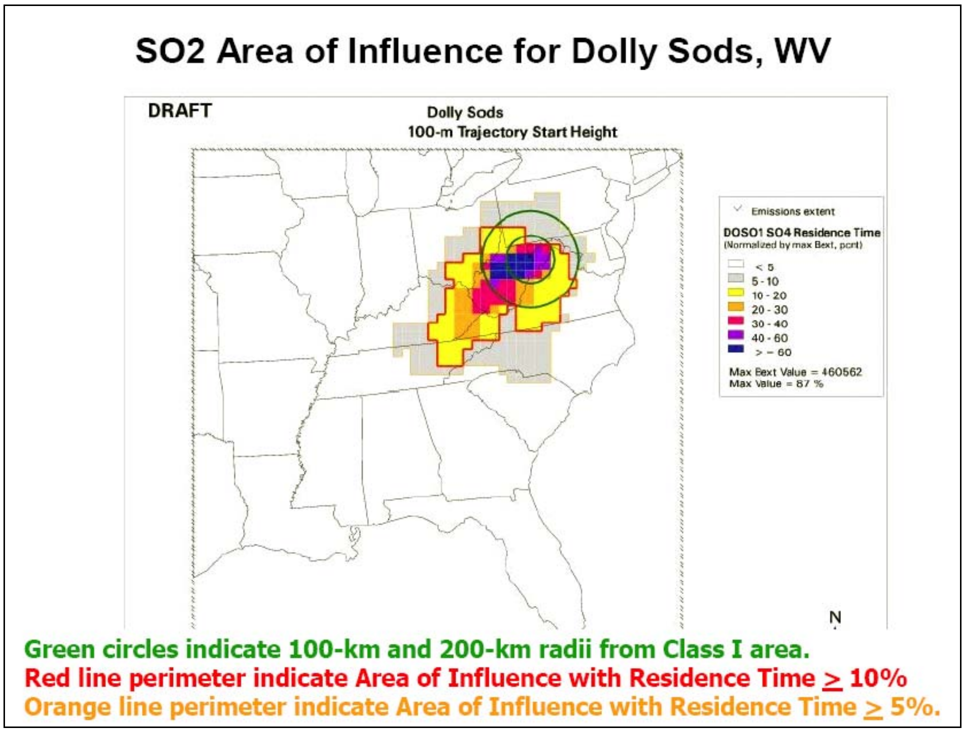


Figure E-14b. 2018 Visibility Projections and 2018 URP Glidepath in deciview for Shenandoah (SHEN), Virginia and Worst 20% (W20%) days using 2002/2018 Base G2 CMAQ 36 km modeling results.

Ohio supports Virginia's determination of reasonable progress for this first planning period for these Class I areas and that on-the-book controls by Ohio constitutes Ohio's fair share of emission reductions.

West Virginia – Dolly Sods/Otter Creek Wilderness Area

West Virginia identified states that are expected to contribute to its Class I areas as those in an area of influence defined by 5 percent or greater sulfate extinction-weighted residence time. The following depicts Dolly Sods/Otter Creek Wilderness' area of influence:



Ohio's contribution, as analyzed by MRPO and identified under Section 10.6.8, was found to be 13 percent. West Virginia's Regional Haze SIP identifies Ohio's percent contribution to SO2 emissions at 7 percent. More significant contributing states identified by West Virginia included: West Virginia (66 percent) and Maryland (12 percent).

West Virginia's Regional Haze SIP identified specific sources (units) in other states calculated to have at least a 0.5 percent calculated impact on Dolly Sods/Otter Creek Wilderness Area. The following Ohio sources (units) were identified on the list: B006 at Muskingum River Power Plant (0.82 percent), and B003 and B004 at Gavin Power Plant (0.52 percent each). As mentioned above, unit B006 at Muskingum River is planning SO2 control to begin in 2015. Both units at the Gavin Power Plant installed and began operating SO2 control (i.e., scrubbers) in 1994 and 1995.

West Virginia determined the VISTAS baseline modeling demonstrated that the 2018 base control scenario (on-the-books) provides for an improvement in visibility better than the uniform rate of progress for Dolly Sods/Otter Creek Wilderness Area for the most impaired days over the first planning period and ensures no degradation in visibility for the least impaired days over the same period, as depicted in the glide path below:

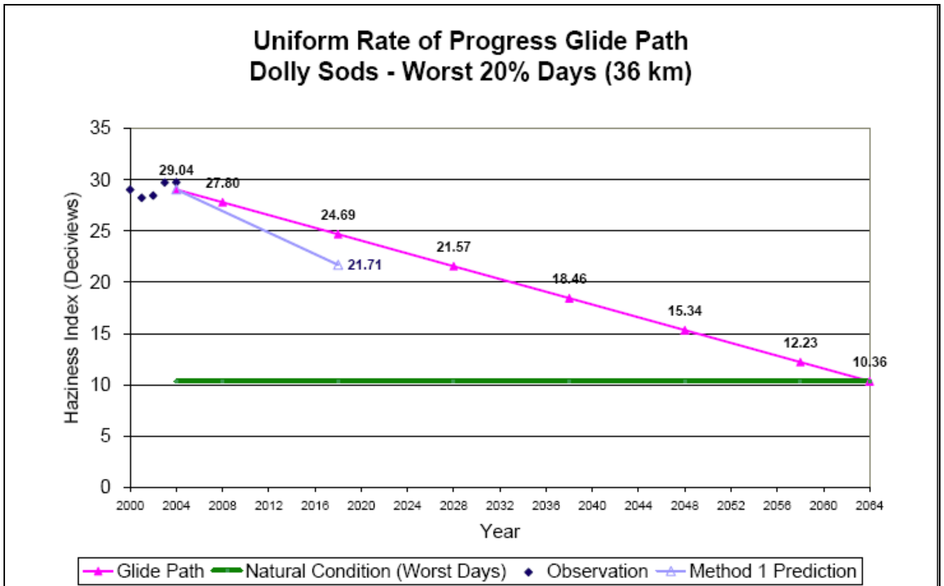


Figure E-15b. 2018 Visibility Projections and 2018 URP Glidepath in deciview for Dolly Sods (DOSO), West Virginia and Worst 20% (W20%) days using 2002/2018 Base G2 CMAQ 36 km modeling results.

Ohio supports West Virginia's determination of reasonable progress for this first planning period for Dolly Sods/Otter Creek Wilderness Area and that on-the-book controls by Ohio constitutes Ohio's fair share of emission reductions.

10.3 Technical Basis for Achieving Fair Share of Emissions Reductions

Ohio is required by 40 CFR 51.308(d)(3)(iii) to document the technical basis, including modeling, monitoring and emissions information, on which Ohio is relying to determine the apportionment of emissions reduction obligations for achieving reasonable progress in each Class I area it affects. Ohio relied on the TSD developed by MRPO and analyses by states, and their RPOs, affected by Ohio's emissions to demonstrate that the Ohio's emission reductions, when coordinated with those of other states/tribes, are sufficient to achieve reasonable progress goals in Class I areas affected by the states. The technical basis has been described throughout this document.

An assessment of the five factors described at the beginning of Section 10 was performed for MRPO by the contractor EC/R Incorporated, "Reasonable Progress for Class I Areas in the Northern Midwest—Factor Analysis" (herein referred to as "Factor Analysis") (Appendix F). While this analysis was targeted at Class I areas in the MRPO region, much of the information can be applied to other Class I areas.

Specifically, EC/R examined reductions in SO2 and NOx emissions from EGUs and ICI boilers; NOx emissions from mobile sources and reciprocating engines and turbines; and ammonia emissions from agricultural operations. The impacts of “on-the-books” controls were also examined to provide a frame of reference for assessing the impacts of the additional control measures.

The results of EC/R’s analysis of the five factors are summarized below:

10.3.1 Factor 1 (Cost of Compliance)

The average cost-effectiveness values are provided in Table 17 of the TSD. For comparison, cost-effectiveness estimates previously provided for “on-the-books” controls for EGUs and ICI boilers include (cost per ton removed basis):

- CAIR - SO2: $700 - $1,200, NOx: $1,400 – $2,600
- BART - SO2: $300 - $963, NOx: $248 - $1,770
- MACT - SO2: $1,500, NOx: $7,600

Additional EGU controls (0.15 lb/million-BTU SO2 and 0.10 lb/million-BTU NOx for EGU1 strategy and 0.10 lb/million BTU SO2 and 0.07 lb/million-BTU for NOx for EGU2 strategy) would double the cost of CAIR and other cap-and-trade programs, on a cost per ton ($/ton) basis as indicated in Tables 4-2 and 6.5-3 of the Factor Analysis. For example, the proposed EGU strategies (EGU1 and EGU2) cost $1540 to $3,016/ton. These costs would be in addition to the $700 to $2,600/ton costs for CAIR and other cap-and-trade programs. Therefore, if the additional EGU strategies were added to the on-the-books controls, EGUs would incur a total cost of $2,260 to $5,616/ton. For ICI boilers, costs were slightly higher compared to EGU costs on a $/ton basis. However, ICI controls were slightly less expensive than controls for EGUs on a $/deciview basis, as indicated in Table 6.5-3 of the Factor Analysis. For reciprocating engines and turbines, the $/ton and $/deciview were less expensive than for EGUs. For agricultural sources (ammonia sources), the $/ton and $/deciview costs had a very wide range, partly due to uncertainty of the emissions and modeling of ammonia sources. However, the lower end of the range was much less than for EGUs, as indicated in Table 6.5-3 of the Factor Analysis. Finally costs for mobile sources vary widely, from potential savings to excessively expensive, as indicated in Table 6.5-3 of the Factor Analysis.

10.3.2 Factor 2 (Time Necessary for Compliance)

EC/R found that all of the control measures could be implemented by 2018.

10.3.3 Factor 3 (Energy and Non-Air Quality Environmental Impacts)

The energy and other environmental impacts are believed to be manageable. For example, the increased energy demand from add-on control equipment is less than 1 percent of the total electricity and steam production in the region, and solid waste disposal and wastewater treatment costs are less than 5 percent of the total operating costs of the pollution control equipment. There would also be health and environmental benefits due to reduced acid deposition, nitrogen deposition, PM2.5 and ozone.

10.3.4 Factor 4 (Remaining Useful Life)

The additional control measures are intended to be market-based strategies applied over a broad geographic region. It is not expected that the control requirements will be applied to units that will be retired prior to the amortization period for the control equipment.

10.3.5 Factor 5 (Visibility Impacts)

Modeling indicated that significant beyond-CAIR reductions from EGUs (EGU1 or EGU2), especially for SO2, would be the most effective control for improving visibility, as indicated in Table 6.5-2 of the Factor Analysis. Ohio has found that analysis by many other states arrived at a similar conclusion. For other sectors, the Factor Analysis shows very limited impact on improving visibility. Agricultural sources would be the next most effective control for visibility improvements. ICI boiler controls would have a small effect on visibility improvement. The last two source categories, reciprocating engines and turbines and mobile sources, show very minor improvements for visibility.

10.4 Baseline Inventory

Ohio is required by 40 CFR 51.308(d)(3)(iii) to identify the baseline inventory on which the long-term strategy is based. Ohio will use 2002 as the baseline inventory and 2005 as the current inventory, as identified in Section 6.

10.5 Anthropogenic Sources of Visibility Impairment

Ohio is required by 40 CFR 51.308(d)(3)(iv) to identify all anthropogenic sources of visibility impairment considered by the state in developing its long-term strategy. Section 6 contains a discussion of anthropogenic sources and includes references where details on the baseline and current emissions inventories can be found. Ohio also analyzed the 2002 NEI (Appendix C).

10.6 Factors the State Must Consider

Ohio is required by 40 CFR 51.308(d)(3)(v) to consider several factors in developing the long-term strategy.

10.6.1 Emissions Reductions Due to Ongoing Air Pollution Programs

Ohio is required by 40 CFR 51.308(d)(3)(v)(A) to consider emission reductions from ongoing pollution control programs. Ohio considered "on-the-books" controls, as identified at the beginning of Section 10, in developing its long-term strategy along with strategies identified in the Factor Analysis as discussed above.

10.6.2 Measures to Mitigate the Impacts of Construction Activities

Ohio is required by 40 CFR 51.308(d)(3)(v)(B) to consider measures to mitigate the impacts of construction activities. Based on baseline emission information supplied in Section 6, Ohio does not believe construction activities in Ohio are a significant contributor to visibility impairment in Class I areas.

When USEPA first promulgated the Regional Haze Rule in 1999, emissions related to construction activities such as windblown dust and nonroad diesel engines were a major concern. This was especially a problem in rapidly growing metropolitan areas such as Los Angeles and Phoenix. Construction activities are directly related to population growth. Ohio has not experienced rapid growth and is not forecasted to in the future (http://www.odod.state.oh.us/Research/files/s101.pdf):

- Ohio's population grew 5.7 percent between 1990 and 2007.
- The 2007 population for Ohio was 11,466,917.
- Ohio's population is projected to grow to 12,005,733 by 2020, a 4.5 percent increase over 2007.

Construction projects in Ohio that disturb one acre or more are required to obtain a general permit under the National Pollutant Discharge Elimination System (NPDES). The permitting program was implemented to protect the waters of the state from sediment and other contaminants, and may also reduce the amount of particulate matter emissions from these activities.

The NPDES permits require permitted entities to develop a storm water pollution prevention plan containing best management practices to control erosion and runoff. Many of the best management practices employed to prevent erosion and runoff are also effective at preventing windblown dust. For example, the use of wind fences, sprinkling, or using vegetative cover such as geotextiles can reduce the amount of airborne particles.

Emissions from diesel engines in the construction industry are expected to decline with the implementation of new federal standards for both on-road and nonroad engines. Additionally, the use of ultra-low sulfur diesel fuel, which is now mandatory for on-road use and is scheduled for all nonroad use in 2010, will achieve reductions in the future.

10.6.4 Emissions Limitations and Schedules of Compliance

Ohio is required by 40 CFR 51.308(d)(3)(v)(C) to identify additional measures to meet reasonable progress goals when ongoing programs alone are not sufficient to meet the goals.

Ohio believes that on-the-books controls provide sufficient measures to achieve reasonable progress goals, recognizing that there will be new additional reductions that will be occurring within and outside of Ohio in response to BART and other states' programs. Ohio has also been implementing additional reductions to meet the 1997 ozone NAAQs and expects to make additional reductions to meet the new 2008 ozone NAAQS, since many counties will likely be nonattainment for the new standard. These reductions, that are still to be determined, will likely reduce visibility impairment at other states' Class I areas.

10.6.5 Source Retirement and Replacement Schedules

Ohio is required by 40 CFR 51.308(d)(3)(v)(D) to consider source retirement and replacement schedules in developing its long term strategy. Retirement and replacement will be managed in conformance with existing SIP requirements pertaining to New Source Review (NSR), both during Prevention of Significant Deterioration and nonattainment NSR permitting.

10.6.6 Agricultural and Forestry Smoke Management Practices

Ohio is required by 40 CFR 51.308(d)(3)(v)(E) to consider smoke management techniques for the purposes of agricultural and forestry management in developing reasonable progress goals. The major pollutant of concern in smoke from wildland fire is fine particulate matter, both PM10 and PM2.5. Based on baseline emission information supplied in Section 6, Ohio does not believe smoke activities in Ohio are a significant contributor to visibility impairment in Class I areas.

In Ohio, emissions from prescribed fires are managed and regulated through interrelated laws and regulations.

Chapter 1503.18 of the Ohio Revised Code (ORC) gives the Ohio Department of Natural Resources (ODNR) Division of Forestry the authority to ban outdoor burning statewide in unincorporated areas during the months of March, April, May, October, and

November in any year, between 6 A.M. and 6 P.M. ORC 1503.18 (C) allows the Chief of the ODNR Division of Forestry to waive the ban expanding the times and places for kindling fires. The Division of Forestry's policy waives the ban only for individuals that have been certified by the Division as a Certified Prescribed Fire Manager.

Ohio Administrative Code (OAC) Chapter 3745-19 "Open Burning Standards", regulates the types of materials that can be burned, locations where they can be burned and determines that no open burning shall be conducted in an area where an air alert, warning, or emergency is in effect. Furthermore, to open burn in many areas, advanced approval from Ohio EPA is required. Open burning is defined as the burning of any material wherein air contaminants resulting from combustion are emitted directly into the ambient air without passing through a stack or chimney.

OAC Chapter 3745-19 allows specific open burning activities such as prescribed fires, for recognized horticultural, silvicultural, range, or wildfire management practices. An application for permission to open burn shall be submitted in writing to the Ohio EPA at least 10 working days before the fire is to be set. OAC Chapter 3745-19 determines that the application for permission to open burn must contain the following minimal information:

- Purpose of the proposed burning;
- Nature of quantities of material to be burned;
- Date or dates when such burning will take place;
- Location of the burning site, including a map showing distances to residences, populated areas, roadways, air fields, and other pertinent landmarks; and
- Methods or actions which will be taken to reduce the emissions of air contaminants.

Ohio is currently developing a Basic Smoke Management Program (SMP) based on USEPA's Interim Air Quality Policy on Wildland and Prescribed Fires recommendations, and will certify in a letter to the USEPA Administrator that a basic program has been adopted and implemented in the future.

The Ohio SMP will establish a basic framework of procedures and requirements for managing smoke from fires managed for resource benefits and will be developed by the Ohio EPA with the cooperation and participation of wildland owners and managers. The purposes of this SMP will be to mitigate the nuisance and public safety hazards (e.g., on roadways, at airports, etc.) posed by smoke intrusions into populated areas and to minimize impacts on air quality.

The SMP will include a process for assessing and authorizing prescribed burns. The following describes the minimal requirements the Ohio Basic Smoke Management Program would consider, complementing Ohio's existing open burning requirements:

- Type of vegetation to be burned.
- Acres to be burned.
- Amount of fuel to be consumed (ton/acre).
- Criteria for making burn/no burn decision.
- Safety and contingency plans addressing smoke intrusions.
- Evaluation of smoke dispersion.
- Public notification.
- Air quality monitoring.
- Public education and awareness.
- Surveillance and enforcement.

10.6.7 Enforceability of Emissions Limitations and Control Measures

Ohio is required by 40 CFR 51.308(d)(3)(v)(F) to ensure that emission limitations and control measures used as part of the long term strategy are enforceable. Ohio will ensure that all BART emission limitations and control measures used to meet reasonable progress goals and as a part of the long term strategy are enforceable by embodying these in rules, federally enforceable permit documents or orders of the director.

10.6.8 Anticipated Net Effect on Visibility Resulting from Projected Changes to Emissions

Ohio is required by 40 CFR 51.308(d)(3)(v)(G) to address the net effect on visibility resulting from changes projected in point, area and mobile source emissions by 2018.
The emission inventory for Ohio projects changes to point, area and mobile source inventories by the end of the first implementation period resulting from population growth; industrial, energy and natural resources development; land management; and air pollution control. The 2002, 2005 and 2018 emissions inventories are contained, and discussed, in Section 4.

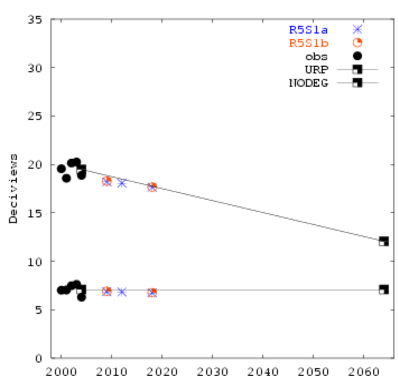
In summary, Ohio's Regional Haze SIP offers the conclusion, supported by MRPO's technical analysis, that year 2064 attainment and intermediate rate-of-progress goals are projected to be achieved at all but a small number of the national parks and wilderness areas in the study area. However, when comparing the rate-of-progress glide path analysis performed by MRPO for both the 2002 (Base K) and 2005 (Base M) base years, the extent of the areas where the rate-of-progress glide path does not show adequate visibility improvement varies as follows:

- Based upon the 2005 base year: Northern Michigan, New Jersey, Maine, and Missouri.
- Based upon the 2002 base year: Northern Minnesota[22] and Northern Michigan.

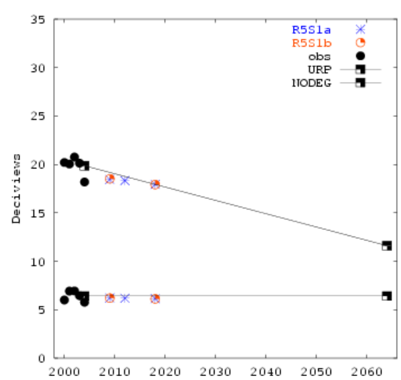
The difference in the two modeling analysis is due primarily to differences in future year emission projections, especially for EGUs which are based upon USEPA's results using IPM2.1.9 for 2002 and IPM3.0 for 2005. For Ohio's Regional Haze SIP, more weight is given to the 2005 base year; however, the results of the 2002 base year analysis should also be weighed.

Recall, as discussed in Section 10.2.2, more recent modeling by MANE-VU states indicates "the uniform rate is achieved and exceeded at all MANE-VU Class I sites." Again, Ohio has committed to continue to work with states regarding the MANE-VU Ask. The following, based upon MRPO modeling, depicts the glide paths for several Class I areas in the Eastern U.S.:

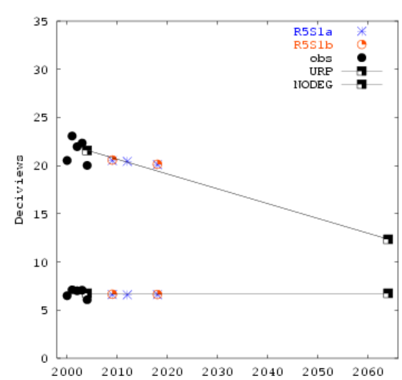
Voyageurs



Boundary Waters

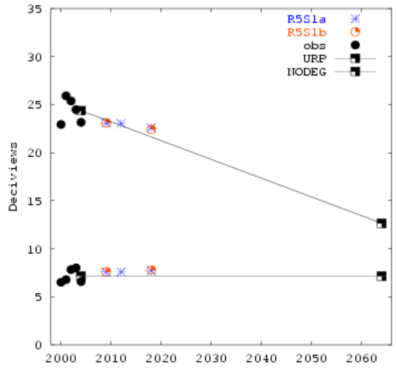


Isle Royale

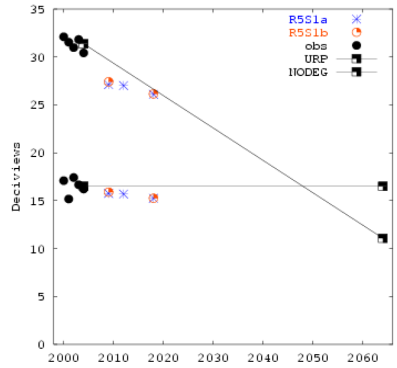


[22] Ohio was not found to be a contributing State to visibility in Minnesota's Class I areas.

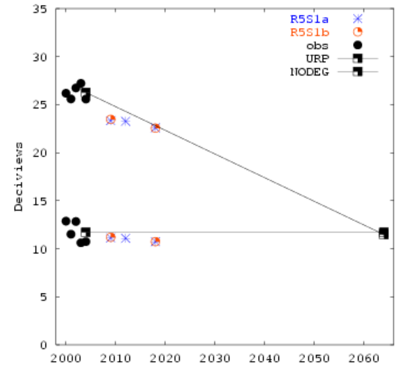
Seney



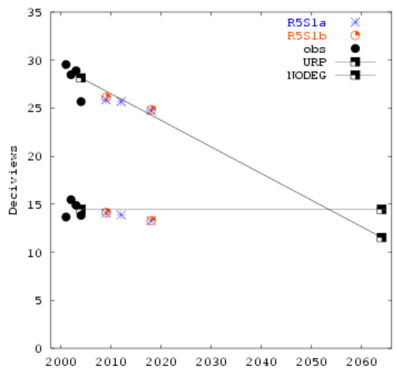
Mammoth Cave



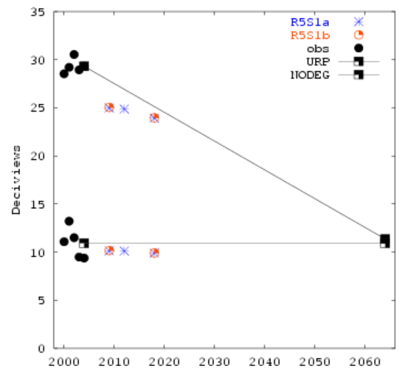
Upper Buffalo



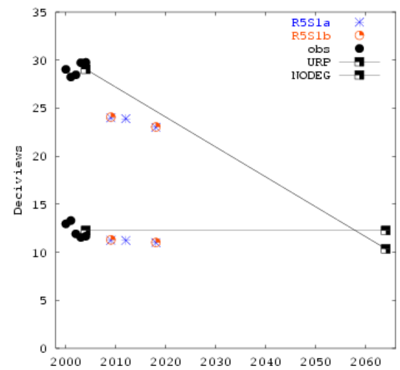
Mingo



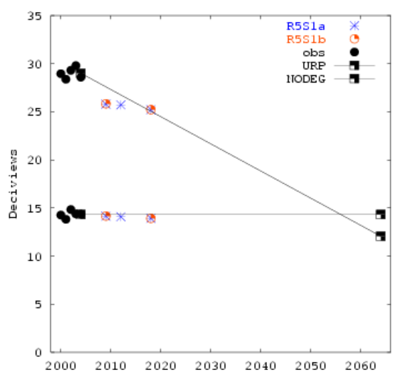
Shenandoah



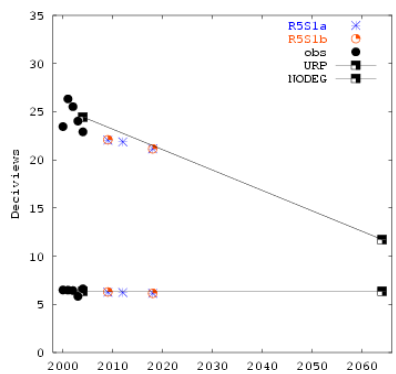
Dolly Sods



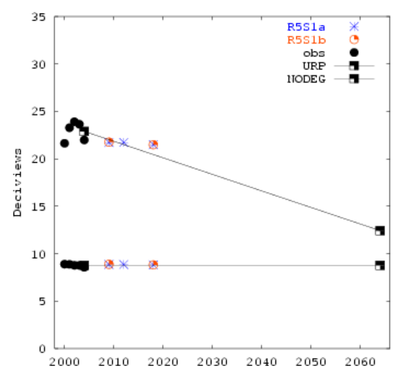
Brigantine



Lye Brook



Acadia



The following tables, based upon MRPO modeling, provide a summary of measured baseline and modeled future year deciview values for several Eastern U.S. Class I areas:

**URP - uniform rate of progress, OTB - on-the-books controls, OTB+Will Do - on-the-books controls plus adjustments for controls from states commitments*

Visibility Modeling (2005 Base M) Results (Deciview) (Worst 20%)

Site	2000-2004 Baseline	2018 URP	2009 OTB	2012 OTB	2018 OTB	2018 OTB+Will Do
Boundary Waters	19.86	17.94	18.45	18.33	17.94	17.92
Voyageurs	19.48	17.75	18.2	18.07	17.63	17.66
Seney	24.38	21.64	23.1	23.04	22.59	22.42
Isle Royale 1	21.59	19.43	20.52	20.43	20.09	20.13
Isle Royale 9	21.59	19.43	20.33	20.22	19.84	19.82
Hercules-Glades	26.75	23.13	24.72	24.69	24.22	24.17
Mingo	28.15	24.27	25.88	25.68	24.74	24.83
Caney Creek	26.36	22.91	23.39	23.29	22.44	22.4
Upper Buffalo	26.27	22.82	23.34	23.27	22.59	22.55
Mammoth Cave	31.37	26.64	27.11	27.01	26.1	26.15
Dolly Sods	29.05	24.69	24	23.9	23	23.04
Shenandoah	29.31	25.12	24.99	24.87	23.92	23.95
James River Face	29.12	24.91	25.17	25.01	24.06	24.12
Brigantine	29.01	25.05	25.79	25.72	25.21	25.22
Lye Brook	24.45	21.48	22.04	21.86	21.14	21.14
Acadia	22.89	20.45	21.72	21.72	21.49	21.49

Visibility Modeling Results (2005 Base M) (Deciview) (Best 20%)

Site	2000-2004 Baseline	2018 URP	2009 OTB	2012 OTB	2018 OTB	2018 OTB+Will Do
Boundary Waters	6.42	6.42	6.21	6.19	6.14	6.12
Voyageurs	7.09	7.09	6.86	6.83	6.75	6.76
Seney	7.14	7.14	7.57	7.58	7.71	7.78
Isle Royale 1	6.75	6.75	6.62	6.59	6.6	6.62
Isle Royale 9	6.75	6.75	6.56	6.55	6.52	6.5
Hercules-Glades	12.84	12.84	12.51	12.32	11.66	11.64
Mingo	14.46	14.46	14.07	13.89	13.28	13.29
Caney Creek	11.24	11.24	10.88	10.85	10.52	10.52
Upper Buffalo	11.71	11.71	11.13	11.08	10.73	10.74
Mammoth Cave	16.51	16.51	15.76	15.69	15.25	15.25
Dolly Sods	12.28	12.28	11.25	11.23	11	11.01
Shenandoah	10.93	10.93	10.13	10.11	9.91	9.91
James River Face	14.21	14.21	13.38	13.38	13.14	13.14
Brigantine	14.33	14.33	14.15	14.08	13.92	13.92
Lye Brook	6.37	6.37	6.25	6.23	6.14	6.15
Acadia	8.78	8.78	8.86	8.86	8.82	8.82

Visibility Modeling (2002 Base K) Results (Deciview) (Worst 20%)

Site	2000-2004 Baseline	2018 URP	2009 OTB	2012 OTB	2018 OTB
Boundary Waters	19.86	17.70	19.05	19.01	18.94
Voyageurs	19.48	17.56	19.14	19.19	19.18
Seney	24.38	21.35	22.98	22.71	22.38
Isle Royale 1	21.59	19.21	20.46	20.28	20.04
Hercules-Glades	26.75	22.76	24.73	24.34	23.85
Mingo	28.15	24.08	25.18	24.67	24.01
Caney Creek	26.36	22.55	24.01	23.55	22.99
Upper Buffalo	26.27	22.47	24.02	23.58	23.06
Mammoth Cave	31.37	26.14	28.06	27.03	25.52
Dolly Sods	29.04	24.23	24.86	23.59	22.42
Shenandoah	29.31	24.67	24.06	22.79	21.57
James River Face	29.12	24.48	24.81	23.79	22.42
Brigantine	29.01	24.68	25.87	25.25	24.39
Lye Brook	24.45	21.16	21.80	21.32	20.69

Visibility Modeling Results (2002 Base K) (Deciview) (Best 20%)

Site	2000-2004 Baseline	2018 URP	2009 OTB	2012 OTB	2018 OTB
Boundary Waters	6.42	6.42	6.71	6.73	6.87
Voyageurs	7.09	7.09	7.21	7.25	7.34
Seney	7.14	7.14	7.19	7.19	7.23
Isle Royale 1	6.75	6.75	6.57	6.51	6.47
Hercules-Glades	12.84	12.84	12.61	12.62	12.61
Mingo	14.46	14.46	13.96	13.93	13.94
Caney Creek	11.24	11.24	10.91	10.92	10.90
Upper Buffalo	11.71	11.71	11.47	11.46	11.42
Mammoth Cave	16.51	16.51	16.06	15.91	15.54
Dolly Sods	12.28	12.28	11.72	11.45	11.19
Shenandoah	10.93	10.93	9.73	9.53	9.17
James River Face	14.21	14.21	13.56	13.33	12.97
Brigantine	14.33	14.33	13.74	13.69	13.47
Lye Brook	6.36	6.36	6.12	6.05	5.96

MRPO's documentation includes culpability studies showing that Ohio's contribution is small. Source apportionment conducted by the MRPO indicates that Ohio's contribution (in 2018) in these Eastern Class I areas is generally less than 5 – 10 percent and all show a decline from 2005 contribution levels (see table below). The locations most highly impacted by Ohio sources, such as Dolly Sods in West Virginia, Mammoth Cave in Kentucky, and Shenandoah Valley and James River in Virginia, show satisfactory progress as discussed and agreed upon in Section 10.2. Substantial SO2 and NOx emission reductions are expected in Ohio pursuant to existing and new control programs. These emission reductions will decrease Ohio's contribution to visibility impairment on the 20 percent worst visibility days in these Eastern Class I areas.

		Ohio Contribution	
		2005	2018
Arkansas	Upper Buffalo	6%	3%
	Caney Creek	5%	3%
Missouri	Mingo	9%	6%
	Hercules-Glades	7%	4%
Virginia	James River	13%	9%
	Shenandoah	11%	8%
W. Virginia	Dolly Sodds	18%	13%
Kentucky	Mammoth Cave	12%	8%
New Jersey	Brigantine	6%	3%
Vermont	Lye Brook	5%	3%
Maine	Acadia	6%	4%
Michigan	Seney	7%	4%

11. Consultation

Ohio does not contain any Class I areas. Ohio, through MRPO, has consulted with the other states/tribes of which Ohio may reasonably be anticipated to cause or contribute to visibility impairment in a Class I area. Ohio is involved with monthly consultation calls with MRPO states, several other CENRAP states, tribes, FLMs, the Ontario Ministry of Environment, and Region 5 EPA. Minutes from these calls can be found on the MRPO website: http://www.ladco.org/reports/rpo/consultation/index.php

12. Inventory Updates, Plan Revisions and Progress Reports

Ohio is required by 40 CFR 51.308(f) to revise its Regional Haze SIP and submit a revised SIP to USEPA by July 31, 2018, and every ten years thereafter. In accordance with the requirements listed in 40 CFR 51.308(f), Ohio commits to revising and submitting this Regional Haze SIP by July 31, 2018 and every ten years thereafter.

Ohio is required by 40 CFR 51.308(d)(4)(v) to include a commitment to update the inventory periodically. In Ohio, major point sources in all counties are required to submit air emissions information annually, in accordance with USEPA's Consolidated Emissions Reporting Rule (CERR). Ohio EPA prepares a new periodic inventory for all sectors every three (3) years. These inventories will be prepared for future years as necessary to comply with the inventory reporting requirements established in the CFR. Emissions information will be compared to the 2002 base year and the future projected year inventories to assess emission trends.

In addition, 40 CFR 51.308(g) requires periodic reports evaluating progress towards the reasonable progress goals established for each mandatory Class I area. In accordance with the requirements listed in 40 CFR 51.308(g), Ohio commits to submitting a report on reasonable progress to USEPA every five years following the initial submittal of the SIP. The report will be in the form of a SIP revision. The reasonable progress report will evaluate the progress made towards the reasonable progress goal for each mandatory Class I area located outside Ohio, which may be affected by emissions from within Ohio**.** All requirements listed in 40 CFR 51.308(g) shall be addressed in the SIP revision for reasonable progress.

13. Adequacy

Depending on the findings of the five-year progress report, Ohio commits to taking one of the actions listed in 40 CFR 51.308(h). The findings of the five-year progress report will determine which action is appropriate and necessary.

List of Possible Actions – 40 CFR 51.308(h)

1) Ohio would determine that the existing SIP required no further substantive revision in order to achieve established goals. Ohio would provide to the Administrator a declaration that further revision of the SIP will not be needed at that time.

2) Ohio would determine that the existing SIP may be inadequate to ensure reasonable progress due to emissions from other states which participated in the regional planning process. Ohio would provide notification to the Administrator and the states that participated in regional planning. Ohio would collaborate with states through the regional planning process to address the SIP's deficiencies.

3) Ohio would determine that the existing SIP may be inadequate to ensure reasonable progress due to emissions from another country. Ohio would provide notification, along with available information, to the Administrator.

4) Ohio would determine that the existing SIP is inadequate to ensure reasonable progress due to emissions within Ohio. Ohio would revise its SIP to address the plan's deficiencies within one year thereafter.