STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

FINAL SUBMITTAL

FLORIDA REGIONAL HAZE PLAN FOR SECOND IMPLEMENTATION PERIOD FOR FLORIDA CLASS I AREAS

October 8, 2021

Executive Summary

Pursuant to the Clean Air Act (CAA) requirements contained in sections 169A and 169B, and the subsequent implementing regulations contained in 40 CFR 51.308, the State of Florida, Department of Environmental Protection (Department), has developed a proposed State Implementation Plan (SIP) revision to address regional haze. The SIP revision represents commitments and actions taken by the state to address the requirements of these regulations during the second implementation period, which includes the years 2019 to 2028, towards the goal of attaining natural visibility conditions in Florida's designated Class I areas.

To develop this proposed SIP revision, the state has relied heavily on the work of the Southeast regional planning group VISTAS (Visibility Improvement States and Tribal Association of the Southeast). VISTAS is directed by the state air directors of ten southeastern states, including the eight U.S. Environmental Protection Agency (EPA), Region 4 states plus Virginia and West Virginia.

The data and analyses necessary to meet the requirements of the federal regional haze regulations are considerable. The ten states, through VISTAS, completed most of the technical requirements using contracted resources. To help coordinate and direct the technical work, VISTAS created the Coordinating Committee, the Technical Analysis Workgroup, the Data Analysis Workgroup, and the SIP Template Workgroup. Each state had at least one representative participating in each group. These workgroups discussed and reviewed the work completed by the contractors used by VISTAS. These data and analyses produced by VISTAS form the technical basis for Florida's proposed SIP revision. Throughout the technical work and SIP development process, VISTAS and the individual states provided updates to EPA Regions 3 and 4, the federal land managers (or their representatives) from the National Park Service, the Fish and Wildlife Service, and the Forest Service, industry representatives, and third-party groups.

Florida's proposed regional haze SIP consists of a set of commitments, permit conditions, and plans addressing the requirements of the federal regulations, as well as supporting administrative and technical documentation. These required elements are contained in this document, *"Florida Regional Haze Plan for the Second Implementation Period"* and Appendices A through I. The full Table of Appendices, which includes descriptions and file names for each appendix and sub-appendix (and indicates which appendices are Florida-specific and which are VISTAS-wide).

The primary elements of the Florida regional haze SIP include:

1. Baseline, Current, and Natural Visibility Conditions - Florida calculated the baseline visibility conditions (2000-2004), current visibility conditions (2014-2018), and natural visibility conditions for the 20% most impaired and 20% clearest days in each Class I area in deciviews:

Class I Area	Baseline Clearest 20%	Baseline Most Impaired 20%	Current Clearest 20%	Current Most Impaired 20%	Natural Clearest 20%	Natural Most Impaired 20%
Chassahowitzka	15.60	24.52	12.41	17.41	6.00	9.03
Everglades	11.69	19.52	10.37	14.90	5.22	8.33
St. Marks	14.34	24.68	11.15	17.39	5.37	9.13

Florida also calculated the actual progress made towards natural visibility conditions to date since the baseline period (current minus baseline), and the additional progress needed to reach natural visibility conditions from current conditions (natural minus current), in deciviews:

Class I Area	Current minus Baseline – Clearest 20%	Current minus Baseline – Most Impaired 20%	Natural minus Current – Clearest 20%	Natural minus Current – Most Impaired 20%
Chassahowitzka	-3.19	-7.11	-6.41	-8.38
Everglades	-1.32	-4.62	-5.15	-6.57
St. Marks	-3.19	-7.29	-5.78	-8.26

2. Reasonable Progress Requirements – The state is required to consider four-factors (cost, time to comply, energy and non-air impacts, and remaining useful life) in determining whether further reductions in visibility-impairing pollutants would be reasonable for any sources in the state. To limit the scope of this requirement, and based on a VISTAS analysis, the Department has focused its response to reasonable progress on sulfur dioxide (SO_2) emissions from large EGU and non-EGU point sources. Based on criteria to identify, from among these sources, those that are most affecting visibility in Class I areas, eleven facilities in Florida and two facilities outside Florida (one in Georgia and one in Kentucky) were selected for review.

Eight of the eleven selected facilities in Florida demonstrated that some or all of the selected units are effectively-controlled, in lieu of a full four-factor analysis, including five power plants with one or more units that meet EPA's Mercury and Air Toxics Standards (MATS) SO_2 limit and three phosphate fertilizer facilities that have recently made significant expenditures to upgrade controls and reduce emissions. Therefore, there is a low likelihood that cost-effective technological advancements exist that could provide further reasonable emission reductions for these sources.

Four of the eleven selected facilities in Florida submitted a full four-factor analysis for at least one selected unit (one power plant, which had also submitted an effective-controls demonstration for other selected units at the plant, and three pulp and paper mills) as the facilities determined that the selected units did not meet the effectively-controlled criteria. The Department is proposing to incorporate permit limits and measures resulting from the effectively-controlled and four-factor analyses in Florida's Regional Haze SIP. The Department has not yet completed the four-factor analysis for two of the pulp and paper mills (Foley Cellulose Perry Mill and the WestRock Panama City Mill); upon completing those, the Department commits to submitting a future SIP submittal supplementing this one. The Department also requested that Georgia and Kentucky complete a reasonable progress analysis on the two facilities selected in those states that affect visibility in Florida Class I areas. The Department has not yet received the final results of the reasonable progress analysis from Georgia or Kentucky.

3. Long-Term Strategy for Regional Haze – Florida has developed a long-term strategy that includes specific enforceable emissions limitations and measures resulting from the reasonable progress analyses discussed above. In developing the long-term strategy, Florida relied on the technical analyses developed by VISTAS and EPA, and considered the effect of emission reductions due to ongoing pollution control programs; measures to mitigate the impacts of construction activities; Florida's smoke management plan; the effect of source retirements and replacement schedules; and the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions expected through 2028.

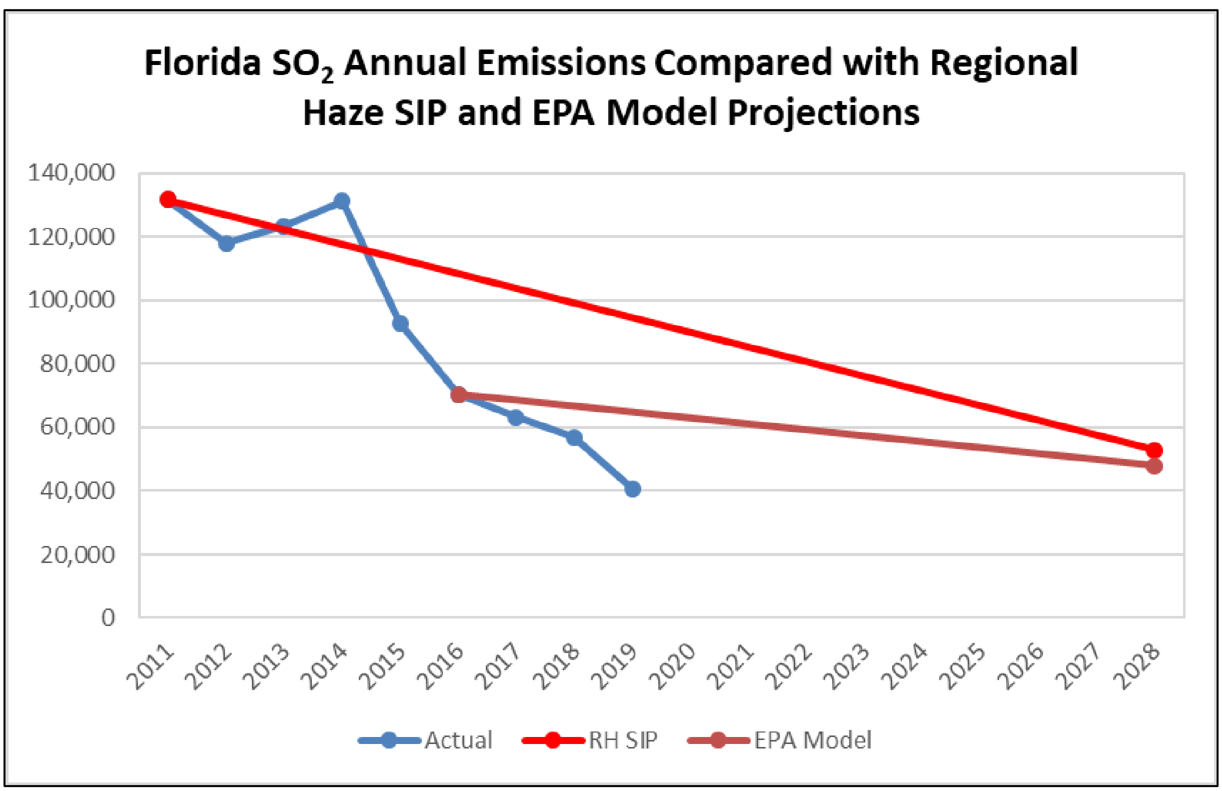
4. Reasonable Progress Goals – The state is required to set reasonable progress goals (RPGs) in units of deciviews applicable for 2028. These goals represent the progress (visibility improvement) expected as a result of implementation of the long-range plan presented in this regional haze SIP. Two goals are set for each Class I area, one for the 20% most impaired days and one for the 20% clearest days (all numbers in deciviews):

Class I Area	Baseline (00-04) Clearest 20%	Baseline (00-04) Most Impaired 20%	Natural Conditions Clearest 20%	Natural Conditions Most Impaired 20%	2028 RPG Clearest 20%	2028 RPG Most Impaired 20%
Chassahowitzka	15.60	24.52	6.00	9.03	12.54	16.79
Everglades	11.69	19.52	5.22	8.33	9.88	13.95
St. Marks	14.34	24.68	5.37	9.13	11.59	16.43

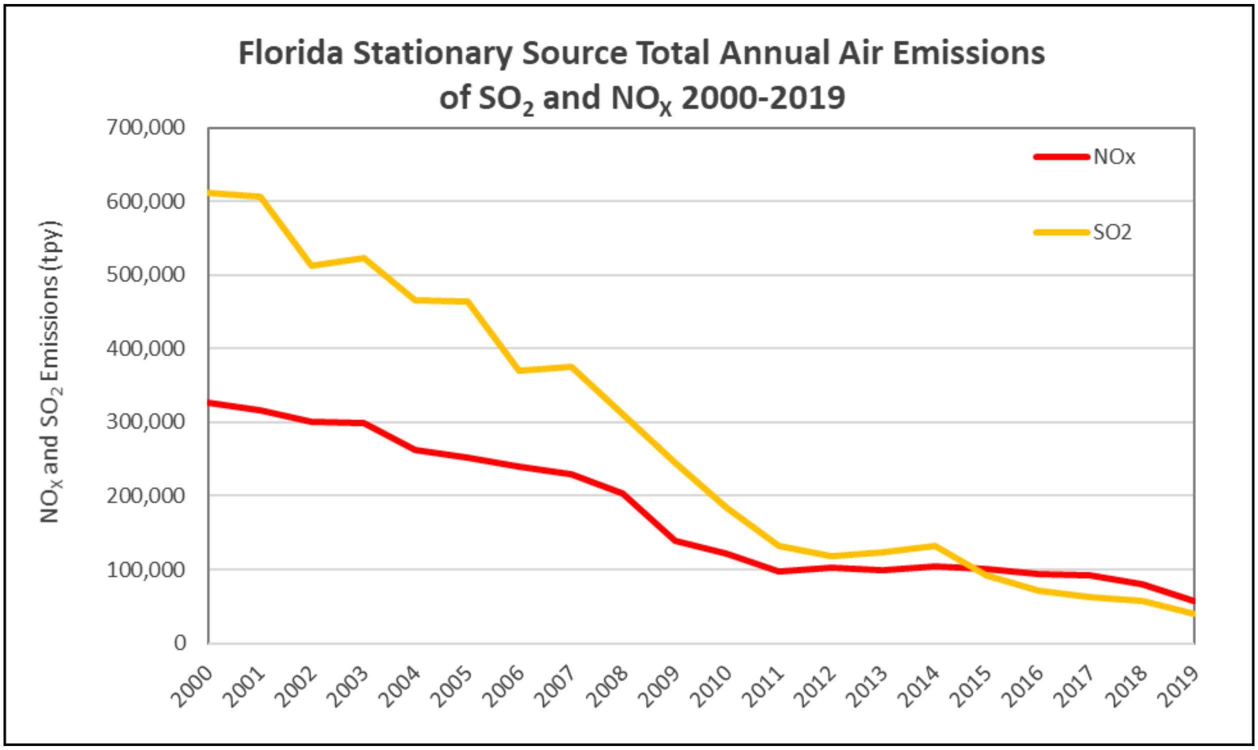
These goals are based upon predicted visibility response to the expected emissions reductions of visibility-impairing pollutants using air quality models and represent the state's best estimate at this time.

Through VISTAS, state-of-the-art air quality modeling was completed to analyze the regional, national, and global contributions to visibility in each Class I area. Emissions of visibility-impairing pollutants were included from all known source sectors and locations, including boundary conditions derived from a global model. Current visibility conditions were evaluated using data from public and private monitoring networks, and these and other associated data were used to validate model performance. Projected emissions were developed for 2028, considering growth and known or estimated emissions changes due to existing regulations. Substantial analysis was completed to determine visibility sensitivity to specific pollutant reductions, and to parse-out the source-sector contributions. EPA also completed regional haze modeling, which Florida is relying on for Everglades due to issues with the VISTAS modeling for Everglades, as discussed throughout the SIP.

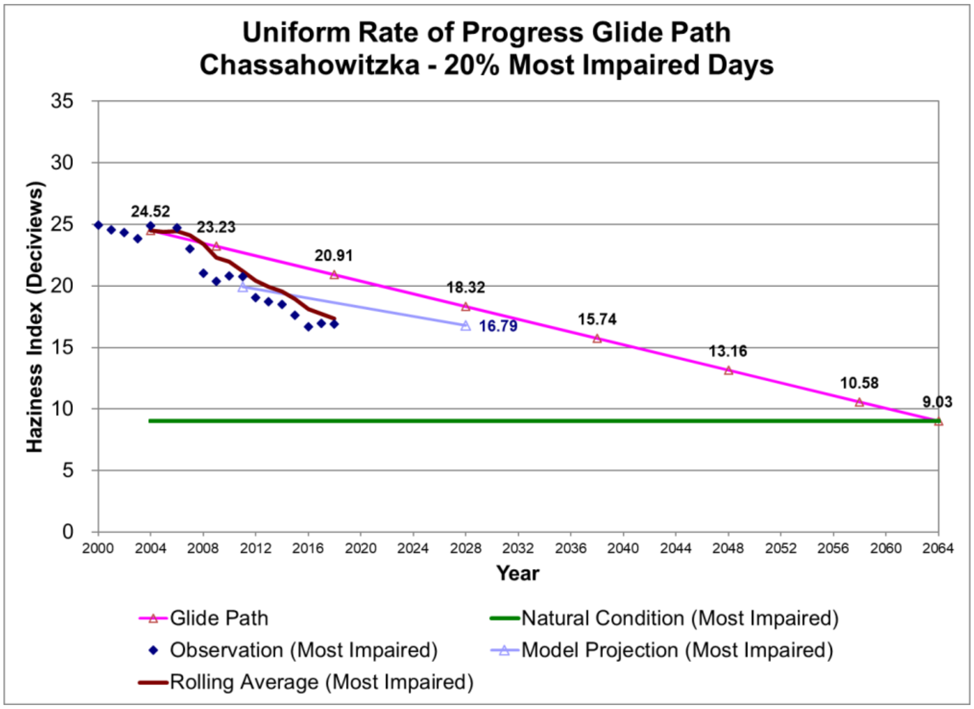
SO_2 remains the dominant visibility-impairing pollutant on the 20% most impaired days in Florida's Class I areas. The following chart shows the actual Florida SO_2 emissions compared to the VISTAS projections used to determine Florida's reasonable progress goals. The 2028 SO_2 emissions inventory is already higher than the recent actual emissions in 2019. This is due to some changes that had not yet occurred at the time Florida put together the 2028 emissions inventory (e.g. units shutting down, switching from coal to more natural gas usage, or installing new controls). The 2028 emissions inventory is discussed in more detail throughout the SIP.

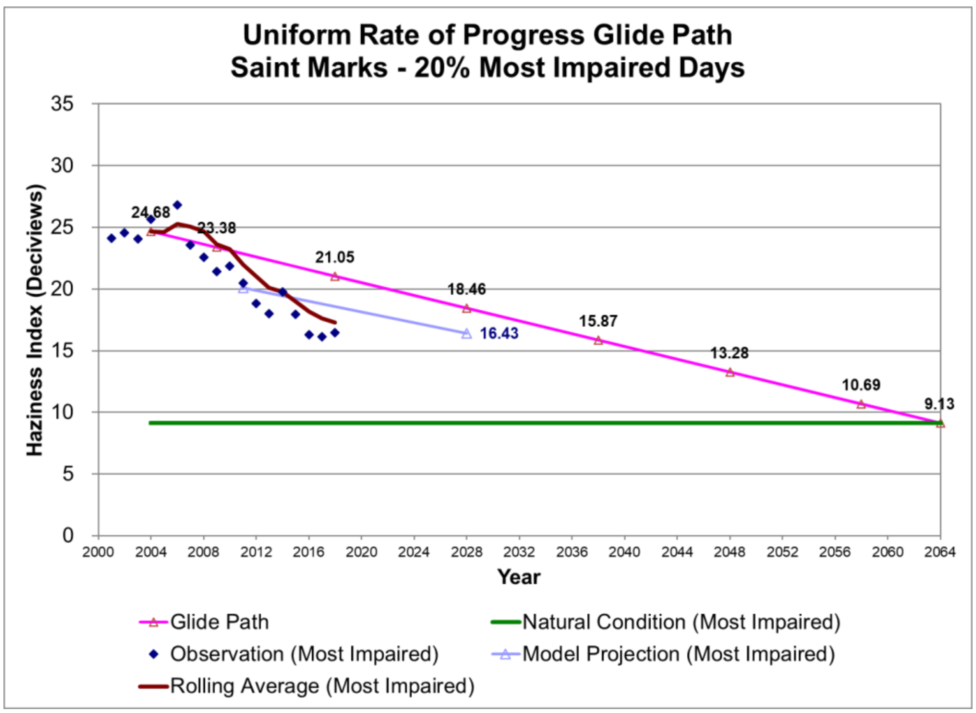


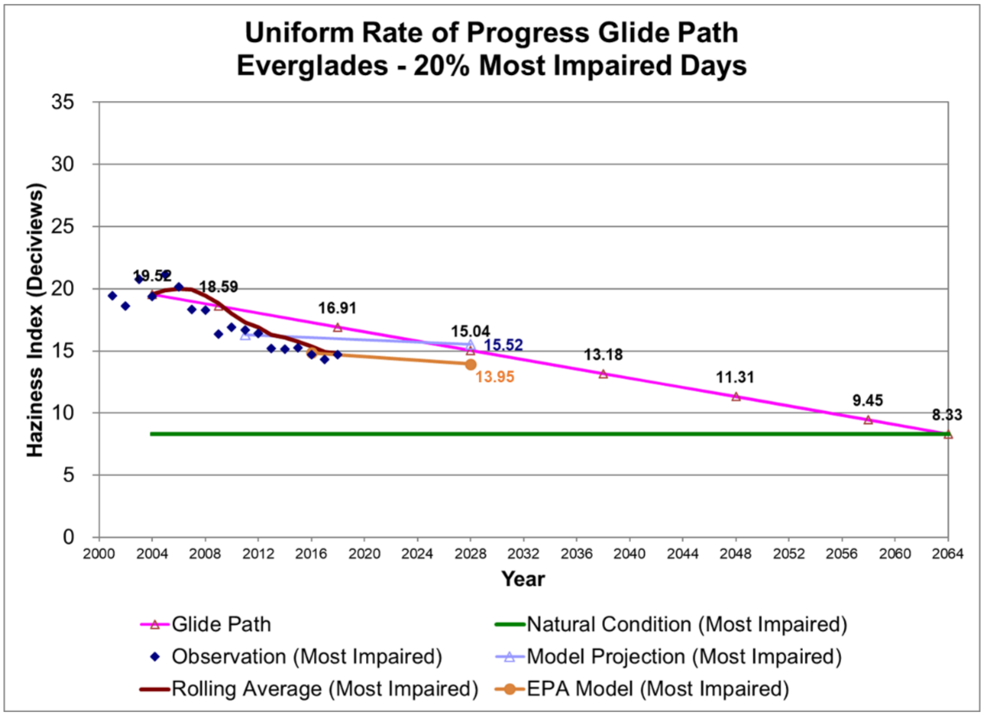
The actual reductions of SO_2 and NO_X emissions from Florida's stationary sources between 2000 and 2019 are seen in the graph below. They are dramatic and reflect significant changes in Florida's stationary source processes.



The following charts show the observed vs. predicted visibility improvement for the 20% most impaired days for each Class I area, and compares these to the Uniform Rate of Progress, the line which connects baseline visibility conditions in 2000-2004 to natural visibility conditions in 2064. All three charts include the VISTAS model projection. The Everglades chart also includes EPA's model projection, which the Department relied on for demonstrating reasonable progress as EPA's model corrected some Everglades-specific deficiencies in the VISTAS model.


Uniform Rate of Progress Glide Path
Chassahowitzka - 20% Most Impaired Days
Haziness Index (Deciviews)
Year
24.52
23.23
20.91
18.32
16.79
15.74
13.16
10.58
9.03
Glide Path
Natural Condition (Most Impaired)
Observation (Most Impaired)
Model Projection (Most Impaired)
Rolling Average (Most Impaired)


Uniform Rate of Progress Glide Path
Saint Marks - 20% Most Impaired Days
Haziness Index (Deciviews)
Year
24.68
23.38
21.05
18.46
16.43
15.87
13.28
10.69
9.13
Glide Path
Natural Condition (Most Impaired)
Observation (Most Impaired)
Model Projection (Most Impaired)
Rolling Average (Most Impaired)



The conclusion of this analysis is that the state can rely on recent emission reductions as well as existing and proposed new regulations, including new reasonable progress emission limits and measures, to provide reasonable progress toward the goal of attaining the natural visibility during the second implementation period ending in 2028.

5. Progress Report – So that this plan revision will also serve as a progress report, Florida has also addressed the progress report requirements of 40 CFR 51.308(g)(1) through (5), covering the period since the most recent progress report.

6. Commitments – Florida commits to providing a supplemental SIP to complete the four-factor analyses for Foley Cellulose Perry Mill and WestRock Panama City Mill. The supplemental SIP will also include an updated permit for WestRock Fernandina Beach that includes monitoring, reporting, and recordkeeping requirements and an evaluation of whether a lower-sulfur back-up fuel should be considered a reasonable progress control. Florida also commits to completing mid-point reviews of the regional haze plan as required in the Regional Haze Rule (40 CFR 51.308(f)). The next mid-point review is due by January 31, 2025. The Department will review the progress of the projected emissions changes to judge the necessity of making any revisions to the plan. Florida also commits to completing comprehensive periodic revisions of the implementation plan for regional haze. The next revision is due to EPA by July 31, 2028, and every ten years thereafter.

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A-2	Work Plan Southeastern VISTAS II Regional Haze Analysis Project April 18, 2018
A-3	VISTAS II Regional Haze Air Quality Report (Final) – February 10, 2021
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B-2a	VISTAS II Regional Haze Analysis Project - Task 2B Emission Inventory Updates Report (2028 Visibility Estimates) September 22, 2020
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E-4	Deposition Model Performance Evaluation Southeaster VISTAS II Regional Haze Analysis Project (Task 8.1) August 17, 2020
E-5	Model Performance Evaluation for Ozone of the CAMx 6.40 Modeling System and the VISTAS II 2011 Updated Modeling Platform (Task 8.0) August 17, 2020 AppendixA1-OzoneMPEbyStation.xlsx Spreadsheets only available in electronic format and upon request.
E-6	Future Year Model Projections Task 9a September 23, 2020 APP_A_ag_v6_40.2028elv5.vistas_12_SESARM (4 Sept 2020).xlsx APP_B_StackedBarCharts.xlsx APP_C_SESARM_2028elv5_URP_20200903.xlsx Spreadsheets only available in electronic format and upon request.
E-7a	Particulate Source Apportionment Technology Modeling Results Task 7 August 31, 2020 ATTACHMENT_A_PSAT_TAG_RESULTS.xlsm ATTACHMENT_B_DAY_BY_DAY_GROUP_10_90_20200824.xlsx Spreadsheets only available in electronic format and upon request.

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*Asterisk indicates VISTAS-wide appendices. All other appendices are Florida-specific. All appendices are available on the Department's FTP site.[1] The FTP site can be accessed using Windows File Explorer.

[1] URL: ftp://ftp.dep.state.fl.us/pub/outgoing/Regional_Haze_SIP/Appendices/

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List of Acronyms and Abbreviations

Acronym/Abbreviation	**Meaning**
AERR	Air Emission Reporting Rule
AFWA	Air Force Weather Agency
AIRMon	Atmospheric Integrated Research Monitoring Network (AIRMon)
AMoN	Ammonia Monitoring Network
AoI	Area of Influence
AQS	Air Quality System network
ARW	Advanced Research WRF model
BART	best available retrofit technology
BEIS	Biogenic Emission Inventory System
BELD	Biogenic Emissions Land Use Database
b_{ext}	visibility impairment as extinction, Mm^{-1}
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CAMD	Clean Air Markets Division
CAMx	Comprehensive Air Quality Model with Extensions
CASTNet	Clean Air Status and Trends Network
CENSARA	Central States Air Resource Agencies
CEMS	continuous emissions monitoring system
CM	course particle mass
CO	carbon monoxide
CONUS	continental U.S.
CoST	Control Strategy Tool
CPP	Clean Power Plan
CSA	North Carolina Clean Smokestacks Act
CSAPR	Cross State Air Pollution Rule
CTG	control technique guideline
CWT	concentration weighted trajectory
d	distance (kilometers)
DEP	Florida Department of Environmental Protection
dv	deciview
E_CM	extinction from coarse matter
EC	elemental carbon
EGU	Electric generating unit
EIA	Energy Information Administration
EIS	Emissions Inventory System
EPA	United States Environmental Protection Agency
ERTAC	Eastern Regional Technical Advisory Committee
EWRT	extinction-weighted residence time
FAA	Federal Aviation Administration
FCCS	Fuel Characteristic Classification System
FDDA	four dimensional data assimilation
FGD	flue gas desulfurization

Acronym/Abbreviation	Meaning
FIA	Forest Inventory and Analysis
FLM	federal land manager
FS	Forest Service
FSL	Forecast Systems Laboratory
FWS	Fish and Wildlife Service
g/bhp-hr	grams per brake horsepower-hour
HAP	hazardous air pollutant
HC	hydrocarbons
H_2SO_4	hydrogen sulfate
HMP	Hazard Mapping System
HNH_4SO_4	ammonium bisulfate
HYSPLIT	Hybrid Single Particle Lagrangian Integration Trajectory Model
ICI	industrial/commercial/institutional
IMPROVE	Interagency Monitoring of Protected Visual Environments
I/O API	Input/Output Applications Programming Interface
IPM	Integrated Planning Model
km	kilometer
kW	kilowatts
LAC	light absorbing carbon
LADCO	Lake Michigan Air Directors Consortium
lbs/mmbtu	pounds per million British thermal units
LEV	California Low Emission Vehicle Standards
m	meters
m^2g^{-1}	meter squared per gram
MACT	maximum achievable control technology
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MATS	Mercury and Air Toxics Standard
MB	mean bias
MDA8	maximum daily 8-hour average
mb	millibar
MJO	multi-jurisdictional organizations
Mm^{-1}	Inverse Megameters
mmbtu/hr	million British thermal units per hour
MOVES	Motor Vehicle Emission Simulator
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NaCl	sodium chloride, sea salt
NADP	National Acid Deposition Program
NAICS	North American Industry Classification System
NCAR	National Center for Atmospheric Research
NCEP	National Centers for Environmental Prediction
NEI	National Emissions Inventory
NEEDS	National Electric Energy Database Systems

Acronym/Abbreviation	**Meaning**
NH_3	ammonia
NH_4^+	ammonium ion
NH_4NO_3	ammonium nitrate
$(NH_4)_2SO_4$	ammonium sulfate
NLCD	National Land Cover Database
NMB	normalized mean bias
NME	normalized mean error
NMHC	non-methane hydrocarbons
NMIM	National Mobile Inventory Model
NTN	National Trends Network
NO	nitric oxide
NO_3^-	nitrate ion
NOAA	National Oceanic and Atmospheric Administration
NODA	notice of data availability
NO_X	nitrogen oxides
NPS	National Park Service
NSPS	New Source Performance Standards
PM	particulate matter
PM_{10}	coarse particulate matter
$PM_{2.5}$	fine particles with a diameter smaller than 2.5 µg
POM	particulate organic matter
ppb	parts per billion
ppm	parts per million
ppmvd	parts per million volume dry
PSAT	Particulate Matter Source Apportionment Technology
PTE	potential to emit
Q	emissions, tons per year
RAAP	Radford Army Arsenal Plant
RACT	reasonably available control technology
RFG	reformulated gasoline
RPG	reasonable progress goal
RPO	regional planning organization
RRF	relative reduction factor
RT	residence time
SAP	sulfuric acid plant
SOAP	secondary organic aerosol partitioning
SCC	source category code
SCR	selective catalytic reduction
SIP	state implementation plan
SMAT-CE	EPA Software for Model Attainment Test – Community Edition
SMOKE	Sparse Matrix Operator Kernel Emissions model
SNCR	selective noncatalytic reduction
SO_2	sulfur dioxide

Acronym/Abbreviation	Meaning
SO_4^{-2}	sulfate ion
TAF	Terminal Area Forecast System
TECO	Tampa Electric Company
tpOS	tons per ozone season
tpy	tons per year
URP	uniform rate of progress
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service
VEPCO	Virginia Electric and Power Company
VISTAS	Visibility Improvement State and Tribal Association of the Southeast
VMT	vehicle miles traveled
VOC	volatile organic compound
WRF	Weather Research and Forecasting
µm	micrometer
$\mu g/m^3$	microgram per cubic meter

1. INTRODUCTION

1.1. What Is Regional Haze?

Regional haze is defined as visibility impairment that is caused by atmosphere-entrained air pollutants emitted from numerous anthropogenic and natural sources located over a wide geographic area. These emissions are often transported long distances. Haze is caused when sunlight is absorbed or scattered by airborne particles which, in turn, reduces the clarity, contrast, color, and viewing distance of what is seen. Regional haze refers to haze that impairs visibility in all directions uniformly.

Pollution from particulate matter (PM) is the major cause of reduced visibility (haze) in the United States, including many of our national parks, forests, and wilderness areas (including 156 mandatory federal Class I areas as defined in 40 CFR 81.400). PM affects visibility through the scattering and absorption of light, and fine particles – particles similar in size to the wavelength of light – are most efficient, per unit of mass, at reducing visibility. Fine particles are produced by a variety of natural and manmade sources. Fine particles may either be emitted directly or formed from emissions of precursors, the most significant of which are sulfur oxides such as SO_2 and NO_X. Reducing fine particles in the atmosphere is generally considered to be an effective method of reducing regional haze and thus improving visibility. Fine particles also adversely impact human health, especially respiratory and cardiovascular systems. EPA has set national ambient air quality standards (NAAQS) for daily and annual levels of fine particles with a diameter equal to or smaller than 2.5 micrometers (μm) ($PM_{2.5}$). In the southeast, the most important sources of $PM_{2.5}$ and its precursors are coal-fired power plants, industrial boilers, process heaters, and other stationary combustion sources. Other significant contributors to $PM_{2.5}$ and visibility impairment include the following source categories: mobile, onroad, and non-road engine emissions; stationary non-combustion emissions (area sources); wildfires and prescribed burning emission; and wind-blown dust.

1.2. What Are The Requirements Under The CAA For Addressing Regional Haze?

In Section 169A of the 1977 Amendments to the Clean Air Act (CAA), Congress set forth a program for protecting visibility in Class I areas that calls for the "prevention of any future, and the remedying of any existing, impairment of visibility caused by anthropogenic (manmade) air pollution.” On December 2, 1980, the EPA promulgated regulations to address visibility impairment (45 Fed. Reg. 80,084) that is "reasonably attributable" to a single source or small groups of sources. These regulations represented the first phase in addressing visibility impairment and deferred action on regional haze that emanates from a variety of sources until monitoring, modeling, and scientific knowledge about the relationships between pollutants and visibility impairment improved.

In the 1990 Amendments to the CAA, Congress added section 169B and called on EPA to issue Regional Haze Rules. The Regional Haze Rule that EPA promulgated on July 1, 1999, (64 Fed. Reg. 35,713) revised the existing visibility regulations to integrate provisions addressing regional haze impairment and established a comprehensive visibility protection program for mandatory federal Class I areas.[2] Each state was required to submit a state implementation plan (SIP) to the EPA by December 17, 2007, which set out that state's plan for complying with the Regional Haze Rule for the first planning period from 2007 to 2018. Each state was required to consult and coordinate with other states and with Federal Land Managers (FLMs) in developing its SIP. 40 CFR 51.308(f) of the 1999 rule required states to submit periodic comprehensive revisions of their regional haze plans by July 31, 2018, and every ten years thereafter. However, on January 10, 2017, EPA revised, among other things, paragraph 40 CFR 51.308(f) of the Regional Haze Rule to change the deadlines for submitting revisions and updates to regional haze plans to July 31, 2021, July 31, 2028, and every ten years thereafter. This SIP was prepared for the second implementation period, which includes years 2019 to 2028.

The Regional Haze Rule addressed the combined visibility effects of various pollution sources over a wide geographic region. This wide-reaching pollution net meant that many states – even those without mandatory federal Class I areas – would be required to participate in haze reduction efforts. Five regional planning organizations (RPOs) were formed to assist with the coordination and cooperation needed to address the visibility issue. These five RPOs are illustrated in Figure 1-1.[3] The Southeastern States Air Resource Managers, Inc. (SESARM) has been designated by EPA as the entity responsible for coordinating regional haze evaluations for the ten Southeastern states (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia), local air pollution control agencies, and tribal authorities. These parties collaborated through the organization known as Visibility Improvement - State and Tribal Association of the Southeast (VISTAS) to prepare the technical analyses and planning activities associated with visibility and related regional air quality issues supporting development of regional haze SIPs for the first and second implementation periods. For the second implementation period, local air pollution control agencies were represented by the Knox County, Tennessee local air pollution control agency and tribal authorities were represented by the Eastern Band of Cherokee Indians.

[2] The regional haze regulations were amended on July 6, 2005 (70 Fed. Reg. 39,104), October 13, 2006 (71 Fed. Reg. 60,612), June 7, 2012 (77 Fed. Reg. 33,642), and January 10, 2017 (82 Fed. Reg. 3,078).

[3] URL: https://www.epa.gov/visibility/visibility-regional-planning-organizations

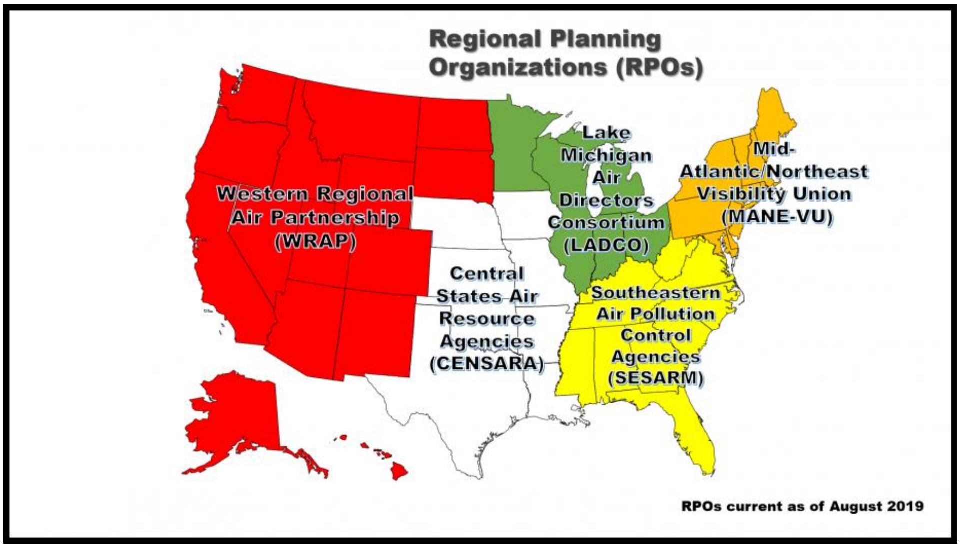

Figure 1-1: Geographical Areas of Regional Planning Organizations

1.3. General Overview of Regional Haze SIP Requirements

The Regional Haze Rule at 40 CFR 51.308(d) requires all states to submit a SIP for regional haze. 40 CFR 51.308(f) of the Regional Haze Rule requires each state to periodically revise and submit revisions to its regional haze SIP. All regional haze SIPs must include the following:

- Reasonable progress goals (RPGs) for each mandatory federal Class I area located within the state;
- Natural, baseline, and current visibility conditions for each mandatory federal Class I area within the state;
- A long-term strategy to address visibility for each mandatory federal Class I area within the state and for each mandatory federal Class I area located outside the state that may be affected by emissions from the state;
- A monitoring strategy for measuring, characterizing, and reporting data that is representative of all mandatory federal Class I areas within the state; and
- Other requirements and analyses.

The Regional Haze Rule requires states to establish RPGs, expressed in deciviews (dv), for the end of each implementation period (approximately ten years) that reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period as a result of enforceable measures required by the Regional Haze Rule and other requirements of the CAA (40 CFR 51.308(f)(3)). The goals must provide for reasonable progress towards achieving natural visibility conditions by providing for improvement in visibility for the most impaired days and ensuring no degradation in visibility for the clearest days over each ten-year period.

The Regional Haze Rule requires states to compute natural visibility conditions for both the 20% most anthropogenically-impaired days (most impaired days) and the 20% clearest days (40 CFR 51.308(f)(1)). For the 20% most impaired days, the Regional Haze Rule directs each state with a Class I area to determine the uniform rate of progress (URP or "glide path") that would need to be maintained during each implementation period to attain natural visibility conditions for the Class I area by 2064. Data from the Interagency Monitoring of Protected Visual Environments (IMPROVE) network are used to establish baseline and natural visibility metrics.[4] States are to establish baseline visibility conditions using a five-year average of monitoring data for 2000-2004 and natural visibility conditions for 2064. A line is drawn between the two data points to determine the URP for the most impaired days. Days with the lowest 20% annual values of the daily haze index are used to represent the clearest days. The requirement of the Regional Haze Rule for 20% clearest days is to ensure that no degradation from the baseline (2000-2004) occurs. For 20% clearest days, the regulatory requirements do not rely on a comparison to the estimated 2064 natural background conditions.

For this second implementation period, regional haze SIPs must include the current visibility conditions for the most impaired and clearest days, the actual progress made towards natural visibility since the baseline period, and the actual progress made during the previous implementation period. The period for calculating current visibility conditions is the most recent five-year period for which data are available. For this SIP, the current visibility conditions include data from years 2014 to 2018. The period for evaluating actual progress made is from the baseline period (2000 to 2004) up to and including the five-year period for calculating current visibility conditions (40 CFR 51.308(f)(1)(iii)-(iv)).

The 2028 RPGs for each Class I area must be met through measures contained in the state's long-term strategy. The long-term strategy must address regional haze visibility impairment for each mandatory federal Class I area within the state and for each mandatory federal Class I area located outside the state that may be affected by emissions from the state. The long-term strategy must include enforceable emissions limitations, compliance schedules, and other measures as necessary to make reasonable progress. Section 169A of the CAA requires a state to consider the four statutory factors (cost of compliance, time necessary for compliance, energy and non-air quality environmental impacts, and remaining useful life) when developing the long-term strategy upon which it bases the RPGs for each Class I area. States are also required to consider the following additional factors in developing their long-term strategies: ongoing air pollution control programs; measures to mitigate the impact of construction activities; source retirement and replacement schedules; smoke management programs for agriculture and forestry; and the

[4] URL: http://vista.cira.colostate.edu/Improve/

anticipated net effect of visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy (40 CFR 51.308(f)(2)).

States must include a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment data that is representative of all mandatory federal Class I areas within the state. The Regional Haze Rule states that compliance with this requirement may be met through participation in the IMPROVE network (40 CFR 51.308(f)(6)).

The SIPs for this second implementation period cover long-term strategies for visibility improvement to the end of the second implementation period (2028). States are required to evaluate progress toward meeting RPGs every five years to assure that emissions controls are on track with emissions reduction forecasts in each SIP. On January 10, 2017, EPA amended 40 CFR 51.308(f) so that the plan revision for the second implementation period will also serve as a progress report and thus address the periodic report requirement specified in 40 CFR 51.308(g)(1) through (5). The next progress report will be due to EPA by January 31, 2025. If emissions controls are not on track to ensure reasonable progress, then states would need to take action to assure emissions controls by 2028 will be consistent with the SIP or to revise the SIP to be consistent with the revised emissions forecast (40 CFR 51.308(f) and 40 CFR 51.308(g)).

EPA provided several guidance documents listed below to assist the states in implementation of the Regional Haze Rule requirements, including documents that specifically address the second implementation period. All VISTAS states followed these guidance documents in developing the technical analyses reported in this plan.

- Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule (EPA-454/B-03-005, September 2003)
- General Principles for 5-year Regional Haze Progress Reports for the Initial Regional Haze State Implementation Plans (Intended to Assist States and EPA Regional Offices in Development and Review of the Progress Reports) (EPA, April 2013)
- Technical Guidance for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program (EPA, December 20, 2018)
- Guidance on Regional Haze State Implementation Plans for the Second Implementation Period (EPA, August 20, 2019)
- Technical Support Document for EPA's 2028 Regional Haze Modeling (EPA, September 19, 2019)
- Recommendation for the Use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program (EPA, June 3, 2020)

1.4. Mandatory Federal Class I Areas in Florida

Florida has four Class I areas within its borders: Everglades National Park (Everglades), Chassahowitzka Wilderness Area (Chassahowitzka), St. Marks Wilderness Area (St. Marks), and Bradwell Bay Wilderness Area. Bradwell Bay Wilderness Area is one of only two Class I areas in the country for which visibility is not considered an important value. As such, the Regional Haze Rule does not apply to Bradwell Bay Wilderness Area. The Florida Division of Air Resource Management (DARM) in the Florida Department of Environmental Protection (Department) is responsible for developing the Regional Haze SIP. This SIP establishes reasonable progress goals for visibility improvement at each of the Florida Class I areas, and a long-term strategy that will achieve those reasonable progress goals within the second regional haze planning period. These Class I Areas for Florida are described at 40 CFR 81.407 and are shown in Figure 1-2.

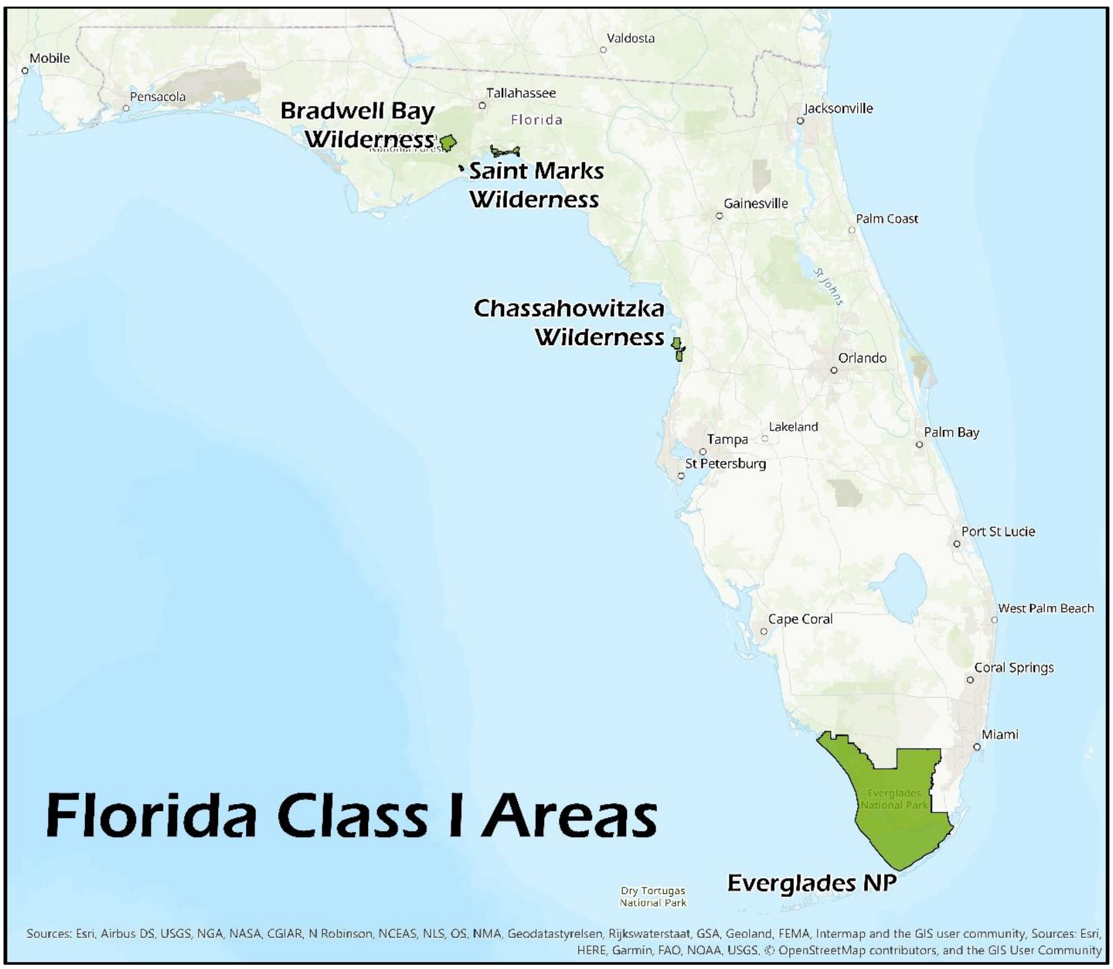

Figure 1-2: Florida's Mandatory Federal Class I Areas

As required by the Regional Haze Rule, the Department has also considered the impacts of emission sources outside of Florida that may affect visibility at these Florida Class I areas and emission sources within Florida that may affect visibility at Class I areas in neighboring states. Through VISTAS, the southeastern states worked together to assess state-by-state contributions to visibility impairment in specific Class I areas, including those in Florida and those affected by emissions from Florida. This technical work is discussed further in Sections 5, 6, and 7 below. Consultations to date between Florida and other states are summarized in Section 10; these consultations are ongoing.

1.5. Regional Planning and Coordination

Successful implementation of a regional haze program involves long-term regional coordination among states. SESARM formed VISTAS in 2001 to coordinate technical work and long-range planning for addressing visibility impairment in each of the eighteen mandatory federal Class I areas in the VISTAS region (see Figure 1-3 and Table 1-1). Florida participated as a member state in VISTAS during the first and second implementation periods. The objectives of VISTAS are as follows:

- To coordinate and document natural, baseline, and current conditions for each Class I area in the Southeast;
- To develop base year and future year emission inventories to support air quality modeling;
- To develop methodologies for screening sources and groups of sources for reasonable progress analysis;
- To conduct photochemical grid modeling to support development of RPGs for each Class I area; and
- To share information to support each state in developing the long-term strategy for its SIP.

In addition, VISTAS states also coordinated with other RPOs to share information and undertake consultation as needed to address visibility impairment associated with sources affecting Class I areas in the VISTAS region and sources in the VISTAS region potentially affecting visibility impairment in another region.

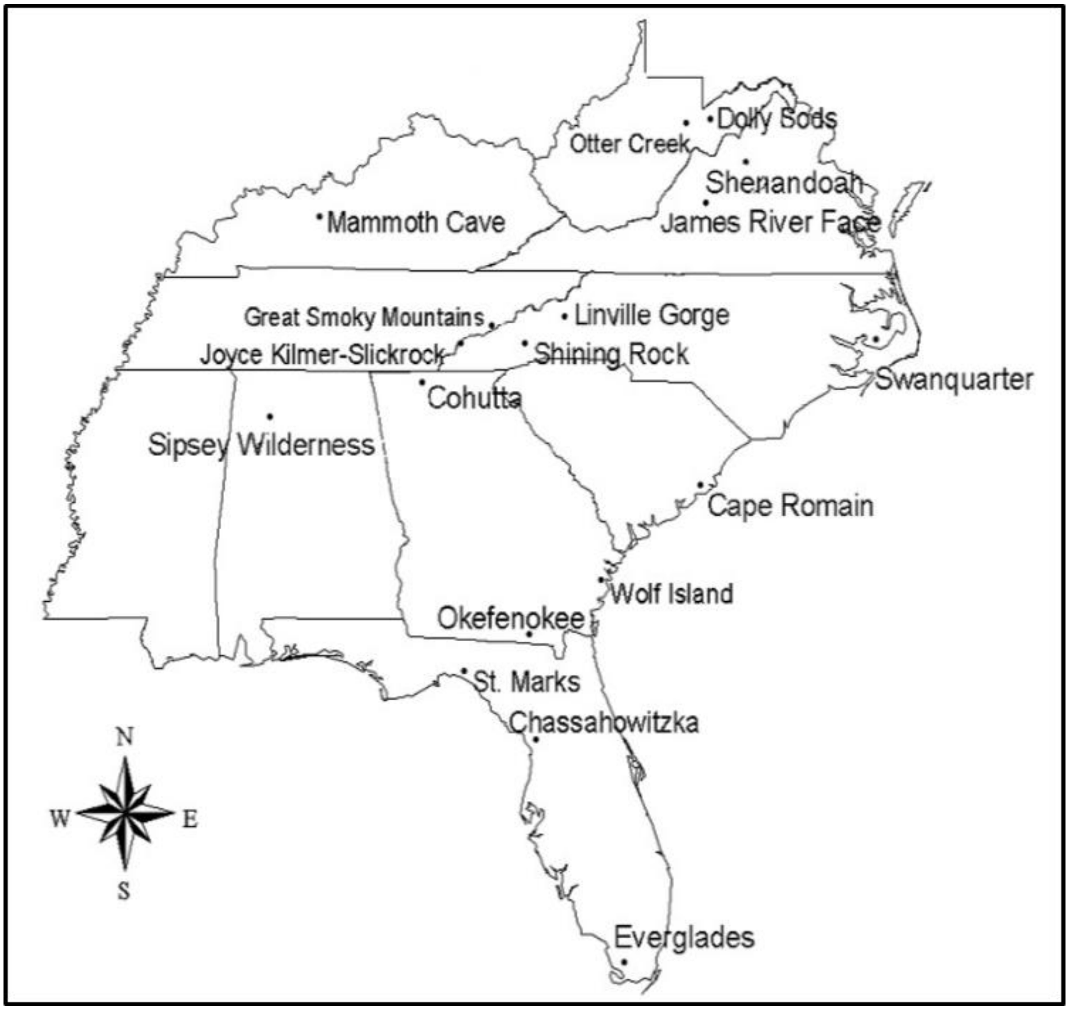

Figure 1-3: Mandatory Federal Class I Areas in the VISTAS Region

Table 1-1: Mandatory Federal Class I Areas in the VISTAS Region

State	Area Name	Acreage	Federal Land Manager
Alabama	Sipsey Wilderness Area	12,646	USDA-FS
Florida	Chassahowitzka Wilderness Area	23,360	USDI-FWS
Florida	Everglades National Park	1,397,429	USDI-NPS
Florida	St. Marks Wilderness Area	17,745	USDI-FWS
Georgia	Cohutta Wilderness Area	33,776	USDA-FS
Georgia	Okefenokee Wilderness Area	343,850	USDI-FWS
Georgia	Wolf Island Wilderness Area	5,126	USDI-FWS
Kentucky	Mammoth Cave National Park	51,303	USDI-NPS
North Carolina	Great Smoky Mountains National Park	273,551	USDI-NPS
North Carolina	Joyce Kilmer-Slickrock Wilderness Area	10,201	USDA-FS
North Carolina	Linville Gorge Wilderness Area	7,575	USDA-FS
North Carolina	Shining Rock Wilderness Area	13,350	USDA-FS
North Carolina	Swanquarter Wilderness Area	9,000	USDI-FWS
South Carolina	Cape Romain Wilderness Area	28,000	USDI-FWS
Tennessee	Great Smoky Mountains National Park	241,207	USDI-NPS
Tennessee	Joyce Kilmer-Slickrock Wilderness Area	3,832	USDA-FS
Virginia	James River Face Wilderness Area	8,703	USDA-FS

Virginia	Shenandoah National Park	190,535	USDI-NPS
West Virginia	Dolly Sods Wilderness Area	10,215	USDA-FS
West Virginia	Otter Creek Wilderness Area	20,000	USDA-FS

1.6. State and FLM Coordination

As required by CAA section 169A(d) and 40 CFR 51.308(i), states must coordinate with the FLMs during the regional haze SIP development process. 40 CFR 51.308(i)(2) requires states to provide opportunity for consultation with FLMs early in the SIP development process. Florida's consultation with the FLMs for the second implementation period is discussed in Section 10.

40 CFR 51.308(i)(3) requires the state to describe how it has addressed any comments provided by FLMs. The Department received comments from the National Park Service (NPS). These comments noted that Florida's regional haze SIP satisfies the reasonable progress requirements for Everglades for the second planning period (see Appendix H). The Department has addressed the NPS comments in Section 10.4. No comments were received during the formal consultation period from United States Department of Interior (USDI) Fish and Wildlife Service (FWS) or the United States Department of Agriculture (USDA) Forest Service (FS).

40 CFR 51.308(i)(4) requires that the regional haze SIP include procedures for continuing consultation between the states and FLMs on the implementation of the visibility protection program. Continuing consultation should encompass development and review of periodic implementation plan revisions and five-year progress reports as well as the implementation of other programs having the potential to contribute to impairment of visibility in any Class I area within the state. Florida commits to ongoing consultation with the FLMs, will follow the consultation requirements in 40 CFR 51.308(i)(3) on any plan revision or progress report, and will engage with the FLMs upon request on any matters related to regional haze affected by Florida sources. Coordination with the FLMs of Florida's continuing obligations to periodically revise its regional haze SIP is also discussed in Section 10.

As required by 40 CFR 51.308(f)(2)(ii), states must also consult with those states that have emissions that are reasonably anticipated to contribute to visibility impairment in the mandatory federal Class I area. Florida's consultation with other states is discussed in Section 10.

1.7. Cross-Reference to Regional Haze Regulatory Requirements

Table 1-2 identifies each section of the SIP that addresses Regional Haze Rule requirements specified in 40 CFR 51.308(f), (g), and (i) for this second implementation period.

Table 1-2: Cross-Reference of Sections in the SIP to Regional Haze Rule Requirements Specified in 40 CFR 51.308(f) and (g)

Rule Section	Chapter/Section in SIP	Description
(f)	11	Requirements for periodic comprehensive revisions of implementation plans for regional haze
(f)(1)	2.1, 2.2, 2.3, 2.4, 2.6, 3	Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress
(f)(1)(i)	2.4	Baseline visibility conditions for the most impaired and clearest days
(f)(1)(ii)	2.3	Natural visibility conditions for the most impaired and clearest days
(f)(1)(iii)	2.6	Current visibility conditions for the most impaired and clearest days
(f)(1)(iv)	2.7	Progress to date for the most impaired and clearest days
(f)(1)(v)	2.7	Differences between current visibility condition and natural visibility condition
(f)(1)(vi)(A)	3	Uniform rate of progress
(f)(1)(vi)(B)	not applicable	Any adjustments to rate of progress
(f)(2)	7.10	Long-term strategy for regional haze
(f)(2)(i)	7	Emission reduction measures that are necessary to make reasonable progress
(f)(2)(ii)	10	Consult with those states that have emissions that are reasonably anticipated to contribute to visibility impairment in the mandatory federal Class I area
(f)(2)(ii)(A)	10	Demonstrate that it has included in its implementation plan all measures agreed to during state-to-state consultations
(f)(2)(ii)(B)	10	Consider the emission reduction measures identified by other states for their sources
(f)(2)(ii)(C)	10	In any situation in which a state cannot agree with another state on the emission reduction measures necessary to make reasonable progress in a mandatory federal Class I area, the state must describe the actions taken to resolve the disagreement
(f)(2)(iii)	2, 4, 5, 6, 7.2, 7.7, 7.8, 9, 10	Document the technical basis, including modeling, monitoring, cost, engineering, and emissions information, on which the State is relying to determine the emission reduction measures that are necessary to make reasonable progress in each mandatory federal Class I area
(f)(2)(vi)(A)	7.2	Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment
(f)(2)(vi)(B)	7.9.2	Measures to mitigate the impacts of construction activities
(f)(2)(vi)(C)	7.2.2	Source retirement and replacement schedules
(f)(2)(vi)(D)	7.2.3, 7.9.1	Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs
(f)(2)(vi)(E)	8	The anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy
(f)(3)(i)	8	Reasonable progress goals – The state must establish reasonable progress goals (expressed in deciviews) that reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period as a result of those enforceable emissions limitations, compliance schedules, and other measures.
(f)(3)(ii)(A)	not applicable	If a state in which a mandatory federal Class I area is located establishes a reasonable progress goal for the most impaired days that provides for a slower rate of improvement in visibility than the uniform rate of progress calculated under paragraph (f)(1)(vi) of this section, the state must demonstrate, based on the analysis required by paragraph (f)(2)(i) of this section, that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the state that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the long-term strategy

Rule Section	Chapter/Section in SIP	Description
(f)(3)(ii)(B)	7	If a state contains sources which are reasonably anticipated to contribute to visibility impairment in a mandatory federal Class I area in another state for which a demonstration by the other State is required under (f)(3)(ii)(A), the state must demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the State that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in its own long-term strategy. The state must provide a robust demonstration, including documenting the criteria used to determine which sources or groups or sources were evaluated and how the four-factors required by paragraph (f)(2)(i) were taken into consideration in selecting the measures for inclusion in its long-term strategy.
(f)(4)	not applicable	If the Administrator, Regional Administrator, or the affected Federal Land Manager has advised a state of a need for additional monitoring to assess reasonably attributable visibility impairment at the mandatory federal Class I area in addition to the monitoring currently being conducted, the State must include in the plan revision an appropriate strategy for evaluating reasonably attributable visibility impairment in the mandatory federal Class I area by visual observation or other appropriate monitoring techniques.
(f)(5)	13	So that the plan revision will serve also as a progress report, the State must address in the plan revision the requirements of paragraphs (g)(1) through (5) of this section. However, the period to be addressed for these elements shall be the period since the most recent progress report.
(f)(6)	9	Monitoring strategy and other implementation plan requirements – States must submit with the implementation plan a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all mandatory federal Class I areas within the state. Compliance with this requirement may be met through participation in the Interagency Monitoring of Protected Visual Environments network.
(f)(6)(i)	not applicable	The establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals are met.
(f)(6)(ii)	9	Procedures by which monitoring data and other information are used in determining the contribution of emissions from within the state
(f)(6)(iii)	not applicable	For a state with no mandatory Class I federal areas, procedures by which monitoring data and other information are used to in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I federal areas in other states.
(f)(6)(iv)	9	The implementation plan must provide for the reporting of all visibility monitoring data to the Administrator at least annually for each mandatory federal Class I area in the state.
(f)(6)(v)	4, 7.2.4	A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory federal Class I area
(f)(6)(vi)	9	Other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.
(g)(1)	13.3	Periodic progress reports must contain at a minimum the following elements: (1) A description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory federal Class I areas both within and outside the State.
(g)(2)	13.5	(2) A summary of the emissions reductions achieved throughout the state through implementation of the measures described in paragraph (g)(1) of this section.

Rule Section	Chapter/Section in SIP	Description
(g)(3)	13.4	(3) For each mandatory Class I Federal area within the State, the State must assess the following visibility conditions and changes, with values for most impaired, least impaired and/or clearest days as applicable expressed in terms of 5-year averages of these annual values. The period for calculating current visibility conditions is the most recent 5-year period preceding the required date of the progress report for which data are available as of a date 6 months preceding the required date of the progress report.
(g)(4)	13.5	(4) An analysis tracking the change over the period since the period addressed in the most recent plan required under paragraph (f) of this section in emissions of pollutants contributing to visibility impairment from all sources and activities within the State. Emissions changes should be identified by type of source or activity. With respect to all sources and activities, the analysis must extend at least through the most recent year for which the state has submitted emission inventory information to the Administrator in compliance with the triennial reporting requirements of subpart A of this part as of a date 6 months preceding the required date of the progress report. With respect to sources that report directly to a centralized emissions data system operated by the Administrator, the analysis must extend through the most recent year for which the Administrator has provided a State-level summary of such reported data or an internet-based tool by which the State may obtain such a summary as of a date 6 months preceding the required date of the progress report. The State is not required to backcast previously reported emissions to be consistent with more recent emissions estimation procedures, and may draw attention to actual or possible inconsistencies created by changes in estimation procedures.
(g)(5)	13.5	(5) An assessment of any significant changes in anthropogenic emissions within or outside the State that have occurred since the period addressed in the most recent plan required under paragraph (f) of this section including whether or not these changes in anthropogenic emissions were anticipated in that most recent plan and whether they have limited or impeded progress in reducing pollutant emissions and improving visibility.
(i)	10.4	State and Federal Land Manager coordination.

2. Natural Background Conditions and Assessment of Baseline, Modeling Base Period, and Current Conditions

The goal of the Regional Haze Rule is to restore natural visibility conditions to the 156 Class I areas identified in the 1977 CAA Amendments. 40 CFR 51.301 contains the following definitions:

> *Natural conditions* reflect naturally occurring phenomena that reduce visibility as measured in terms of light extinction, visual range, contrast, or coloration, and may refer to the conditions on a single day or set of days. These phenomena include, but are not limited to, humidity, fire events, dust storms, volcanic activity, and biogenic emissions from soils and trees. These phenomena may be near or far from a Class I area and may be outside the United States.
>
> *Natural visibility* means visibility (contrast, coloration, and texture) on a day or days that would have existed under natural conditions. Natural visibility varies with time and location, is estimated or inferred rather than directly measured, and may have long-term trends due to long-term trends in natural conditions.
>
> *Natural visibility condition* means the average of individual values of daily natural visibility unique to each Class I area for either the most impaired days or the clearest days.

The regional haze SIPs must contain measures that make "reasonable progress" toward achieving natural visibility conditions by reducing anthropogenic, i.e., manmade emissions that cause haze.

An easily understood measure of visibility to most people is visual range. Visual range is the greatest distance, in kilometers or miles, at which a dark object can be viewed against the sky. For evaluating the relative contributions of pollutants to visibility impairment, however, the most useful measure of visibility impairment is light extinction, which affects the clarity and color of objects being viewed.

The measure used by the Regional Haze Rule is the deciview index, as required by 40 CFR 51.301. Deciviews are calculated directly from light extinction using the following logarithmic equation:

$$dv = 10 * \ln\left(\frac{b_{ext}}{10 * Mm^{-1}}\right)$$

In this equation, the atmospheric light extinction coefficient, b_{ext}, is expressed in units of inverse megameters (Mm^{-1}).[5] The dv units are useful for tracking progress in improving visibility because each dv change is an equal incremental change in visibility perceived by the human eye. Most people can detect a change in visibility at one dv.

For each Class I area, there are three metrics of visibility that are part of the determination of reasonable progress:

- natural conditions,
- baseline conditions, and
- current conditions.

Each of the three metrics includes the concentration data of the visibility-impairing pollutants as different terms in the IMPROVE light extinction algorithm, with respective extinction coefficients and relative humidity factors. Total light extinction when converted to dv is calculated for the average of the 20% clearest and 20% most impaired days. The terminology for these two sets of days changed for the second round of regional haze planning owing to a focus on anthropogenically-induced visibility impairment[6] instead of only looking at the "worst days."

"Natural" visibility is determined by estimating the natural concentrations of visibility pollutants and then calculating total light extinction. "Baseline" visibility is the starting point for the improvement of visibility conditions. Baseline visibility is calculated from the average of the IMPROVE monitoring data for 2000 through 2004. The comparison of initial baseline conditions from 2000-2004 to natural visibility conditions indicates the amount of improvement necessary to attain natural visibility by 2064. Each state must estimate natural visibility levels for Class I areas within its borders in consultation with FLMs and other states as required by 40 CFR 51.308(f)(1).

Another important set of visibility monitoring data is the base period used for air quality modeling projections, in this case monitoring data from years 2009 through 2013. These monitoring data are used in conjunction with inventory and meteorological data to project expected visibility parameters for each Class I area, as described in Sections 5, Section 6, and Section 7.2.6.2.

[5] Colorado State University, "The IMPROVE Algorithm." URL: http://vista.cira.colostate.edu/Improve/haze-metrics-converter/

[6] EPA, "Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program", December 2018. URL: https://www.epa.gov/sites/production/files/2018-12/documents/technical_guidance_tracking_visibility_progress.pdf

"Current conditions" are assessed every five years as part of the regional haze planning process where actual progress in reducing visibility impairment is compared to the reductions delineated in the SIP. The five-year period comprising current conditions in this SIP is 2014 through 2018, inclusive.

2.1. IMPROVE Algorithm

The IMPROVE algorithm for estimating light extinction was adopted by EPA as the basis for the regional haze metric used to track progress in reducing haze levels and estimates light extinction, which is then converted to the dv haze index.

The IMPROVE equation accounts for the effect of particle size distribution on light extinction efficiency of sulfate, nitrate, and organic carbon; the equation also accounts for light extinction by sea salt and light absorption by gaseous nitrogen dioxide. Site-specific values are used for Rayleigh scattering to account for the site-specific effects of elevation and temperature. Separate relative humidity enhancement factors are used for small and large size distributions of ammonium sulfate and ammonium nitrate and for sea salt. A complete description of the terms in the IMPROVE equation is given on the IMPROVE website.[7]

The algorithm has been revised over the years to produce consistent estimates of light extinction for all remote-area IMPROVE aerosol monitoring sites. It permits the individual particle component contributions to light extinction to be separate estimates. The current IMPROVE equation includes contributions from sea salt and an increase in the multiplier for contributions from POM as compared to the previous IMPROVE algorithm.

In the IMPROVE algorithm, as described in the equation below, light extinction (b_{ext}) and Rayleigh scattering are described in units of Mm^{-1}. Dry mass extinction efficiency terms are in units of meter squared per gram (m^2g^{-1}). Water growth terms, *f(RH)*, are unitless. The total sulfate, nitrate, and organic compound concentrations are each split into two fractions, representing small and large size distributions of those components. For masses less than 20 $\mu g/m^3$, the fraction in the large mode is estimated by dividing the total concentration of the component by 20 $\mu g/m^3$. If the total concentration of a component exceeds 20 $\mu g/m^3$, all is assumed to be in the large mode. The small and large modes of sulfate and nitrate have relative humidity correction factors, $f_S(RH)$ and $f_L(RH)$, applied since these species are hygroscopic (i.e. absorb water), and their extinction efficiencies change with relative humidity.

[7] Colorado State University, "The IMPROVE Algorithm", URL: http://vista.cira.colostate.edu/Improve/the-improve-algorithm/.

$$b_{ext} \approx 2.2 \times f_S(RH) \times [Small\ Ammonium\ Sulfate] + 4.8 \times f_L(RH) \times [Large\ Ammonium\ Sulfate] + 2.4 \times f_S(RH) \times [Small\ Ammonium\ Nitrate] + 5.1 \times f_L(RH) \times [Large\ Ammonium\ Nitrate] + 2.8 \times [Small\ Organic\ Mass] + 6.1 \times [Large\ Organic\ Mass] + 10 \times [Elemental\ Carbon] + 1 \times [Final\ Soil] + 1.7 \times f_{SS}(RH) \times [Sea\ Salt] + 0.6 \times [Coarse\ Mass] + Rayleigh\ Scattering(Site\ Specific) + 0.33 \times [NO_2(ppb)]$$

More information on the IMPROVE algorithm may be found in Appendices E-1a and E-1b.

2.2. IMPROVE Monitoring Sites

Table 2-1 provides the VISTAS Class I areas and their associated monitoring site identification numbers. In certain instances, a Class I area may not have a monitoring site located within its boundaries. Such sites rely on data from nearby monitoring sites to act as surrogates within the analyses described in this SIP revision. For Class I areas in the Southeastern U.S., Joyce Kilmer-Slickrock Wilderness Area relies upon data from the Great Smoky Mountains National Park IMPROVE monitoring site (GRSM1), Otter Creek Wilderness Area relies on data from the Dolly Sods Wilderness Area IMPROVE monitoring site (DOSO1), and Wolf Island National Wilderness Area relies on data from the Okefenokee National Wilderness Area IMPROVE monitoring site (OKEF1). For the analyses described within this document, site-specific data such as elevation and location are used for these areas in combination with the monitoring data from the surrogate IMPROVE site. Table 2-1 provides the IMPROVE site identification number for the surrogate monitor in these situations.

Table 2-1: VISTAS Class I Areas and IMPROVE Site Identification Numbers

Class I Area	IMPROVE Site Identification Number
Cape Romain National Wilderness Area	ROMA1
Chassahowitzka National Wilderness Area	CHAS1
Cohutta Wilderness Area	COHU1
Dolly Sods Wilderness Area	DOSO1
Everglades National Park	EVER1
Great Smoky Mountains National Park	GRSM1
James River Face Wilderness Area	JARI1
Joyce Kilmer-Slickrock Wilderness Area	GRSM1
Linville Gorge Wilderness Area	LIGO1
Mammoth Cave National Park	MACA1
Okefenokee National Wilderness Area	OKEF1
Otter Creek Wilderness Area	DOSO1
Shenandoah National Park	SHEN1
Shining Rock Wilderness Area	SHRO1
Sipsey Wilderness Area	SIPS1
St. Marks Wilderness Area	SAMA1
Swanquarter Wilderness Area	SWAN1
Wolf Island Wilderness Area	OKEF1

2.3. Estimating Natural Conditions for VISTAS Class I Areas

Natural background visibility, as defined in Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Program, EPA-454/B-03-005, September 2003,[8] is based on annual average concentrations of fine particle components. There are two separate methodologies to compute natural conditions: one methodology for the 20% clearest days and one for the 20% most impaired days. In the first round of regional haze planning as well as the first mid-course review, these days were referred to as the 20% best and 20% worst days, respectively. These terms were updated to "clearest" and "most impaired" (based on anthropogenic visibility impairment) as part of two recent actions by EPA: a rule amending requirements for state plans finalized in January 2017,[9] and EPA's Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program that updates recommended methodologies for tracking visibility impairment, issued in December 2018.[10] Also, as part of EPA's 2018 guidance, the recommended methodology for computing natural conditions for the 20% most impaired days changed, while no change was made for the 20% clearest days.

Natural background conditions using the current IMPROVE equation are calculated separately for each Class I area, and the methodology for calculating background conditions for the 20% most impaired days and the 20% clearest days are discussed in the preceding sections. Broadly speaking, however, the new calculation of natural background allows Rayleigh scattering to vary with elevation. Secondly, natural conditions are adjusted (as with the 20% most impaired days) to reflect impacts of natural events heretofore unrecognized in the computation of visibility under natural background conditions.

2.3.1. Natural Background Conditions on 20% Clearest Days

EPA's 2018 guidance memo notes that days with the lowest 20% annual values of the daily haze index are used to represent the clearest days and are not selected based on the lowest anthropogenic impairment. The requirements of the Regional Haze Rule for 20% clearest days is to ensure that no degradation from the baseline (2000-2004) occurs and do not rely on a comparison to the estimated natural background conditions on the 20% clearest days.

[8] URL: https://www3.epa.gov/ttnamti1/files/ambient/visible/tracking.pdf

[9] Final Rule: Protection of Visibility: Amendments to Requirements for State Plans, 82 Fed. Reg. 3,078 (January 10, 2017).

[10] EPA, "Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program", December 2018. URL: https://www.epa.gov/sites/production/files/2018-12/documents/technical_guidance_tracking_visibility_progress.pdf

2.3.2. Natural Background Conditions on 20% Most Impaired Days

The methodology for computing natural background values for the 20% most impaired days separates observed visibility impairment into natural and anthropogenic contributions. The days with the highest anthropogenic visibility impairment contribution are what now comprise the 20% most impaired days, as opposed to the entirety of the visibility impairment portfolio that comprised the 20% haziest days previously. The reason for this change was to separate visibility impairment associated with significant natural events such as wildfires and dust storms, over which states have no control, from visibility impairment associated with anthropogenic emissions sources, which states may control. Further, the EPA notes that visibility conditions have never been measured without any anthropogenic impairment whatsoever, and so such conditions must be estimated.

Within these 20% most impaired days at a given Class I site, the natural visibility impairment for each day measured at said Class I site from 2000 to 2014, inclusive, are aggregated. That average value then becomes the natural background endpoint for the 20% most impaired days at the given Class I site. The 2018 EPA guidance (p. 15) notes that these new natural background visibility values are "consistently" lower than the prior natural values for 20% haziest days. The natural background conditions computed and utilized by VISTAS for the 20% most impaired days at Class I sites follow the 2018 EPA guidance without exception.

2.3.3. Summary of Natural Background Conditions for VISTAS Class I Areas

Table 2-2 provides a summary of the natural background conditions for VISTAS Class I areas.

Table 2-2: Average Natural Background Conditions for VISTAS Class I Areas

Class I Areas	Average for 20% Most Impaired Days*	Average for 20% Clearest Days**
Cape Romain National Wilderness Area	9.79 dv	5.93 dv
Chassahowitzka National Wilderness Area	9.03 dv	6.00 dv
Cohutta Wilderness Area	9.88 dv	4.42 dv
Dolly Sods Wilderness Area	8.92 dv	3.64 dv
Everglades National Park	8.33 dv	5.22 dv
Great Smoky Mountains National Park	10.05 dv	4.62 dv
James River Face Wilderness Area	9.47 dv	4.39 dv
Joyce Kilmer-Slickrock Wilderness Area	10.05 dv	4.62 dv
Linville Gorge Wilderness Area	9.70 dv	4.07 dv
Mammoth Cave National Park	9.80 dv	5.00 dv
Okefenokee National Wilderness Area	9.45 dv	5.43 dv
Otter Creek Wilderness Area	8.92 dv	3.64 dv
Shenandoah National Park	9.52 dv	3.15 dv
Shining Rock Wilderness Area	10.25 dv	2.49 dv
Sipsey Wilderness Area	9.62 dv	5.03 dv
St. Marks Wilderness Area	9.13 dv	5.37 dv

Class I Areas	Average for 20% Most Impaired Days*	Average for 20% Clearest Days**
Swanquarter Wilderness Area	10.01 dv	5.71 dv
Wolf Island Wilderness Area	9.45 dv	5.43 dv

* Data taken from Table 1 in the EPA memorandum with subject: Technical addendum including updated visibility data through 2018 for the memo titled, "Recommendation for the use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program."[11]

2.4. Baseline Conditions

Data for years 2000-2004 described in this section are derived from technical support documents located in Appendix E-6. These data were gathered in 2017 at the commencement of the regional haze planning efforts for this second round of planning. These data do not reflect the changes made to the IMPROVE data set since that time. For certain VISTAS Class I areas, the 2000-2004 baseline values for 20% most impaired days and 20% clearest days provided in this section are different than those provided in Section 3 and Section 9 because data in Section 3 and Section 9 are based on a later IMPROVE data set (sia_impairment_daily_budgets_10_18.zip). Specifically, the 2000-2004 20% most impaired day data for Chassahowitzka and St. Marks show minor differences between the two data sets. The 2000-2004 20% clearest day data for Chassahowitzka also shows differences.

Baseline visibility conditions at each Florida Class I area are estimated using sampling data collected at IMPROVE monitoring sites at three of the four Class I areas in Florida. A five-year average (2000 to 2004) was calculated for the 20% clearest days as well as the 20% most impaired days at each Class I site in accordance with 40 CFR 51.308(f)(1); Guidance for Tracking Progress Under the Regional Haze Rule, EPA-454-03-004, September 2003; and the 2018 EPA guidance. IMPROVE data records for Chassahowitzka for the period 2000 to 2004 meet the EPA requirements for data completeness (75% for the year and 50% for each quarter). IMPROVE data records for St. Marks and Everglades had missing data in the year 2000. Data records for these sites were filled using data substitution procedures outlined in Appendix C.

2.4.1. Baseline Conditions for 20% Clearest and 20% Most Impaired Days for VISTAS Class I Areas

Table 2-3 provides a summary of the baseline conditions (2000-2004) for the 20% clearest and 20% most impaired days at VISTAS Class I areas. The baseline dv index values for the 20% most impaired and 20% clearest days at these Class I areas are based on data included in Table 1 in the EPA memorandum with subject: Technical addendum including updated visibility data

[11] URL: https://www.epa.gov/sites/production/files/2020-06/documents/memo_data_for_regional_haze_technical_addendum.pdf

through 2018 for the memo titled, "Recommendation for the use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program."[12].

Table 2-3: Baseline Visibility Conditions for VISTAS Class I Areas (2000-2004)

Class I Areas	Average for 20% Most Impaired Days	Average for 20% Clearest Days
Cape Romain National Wilderness Area	25.25 dv	14.29 dv
Chassahowitzka National Wilderness Area	24.52 dv	15.60 dv
Cohutta Wilderness Area	29.12 dv	13.73 dv
Dolly Sods Wilderness Area	28.29 dv	12.28 dv
Everglades National Park	19.52 dv	11.69 dv
Great Smoky Mountains National Park	29.11 dv	13.58 dv
James River Face Wilderness Area	28.08 dv	14.21 dv
Joyce Kilmer-Slickrock Wilderness Area	29.11 dv	13.58 dv
Linville Gorge Wilderness Area	28.05 dv	11.11 dv
Mammoth Cave National Park	29.83 dv	16.51 dv
Okefenokee National Wilderness Area	25.34 dv	15.23 dv
Otter Creek Wilderness Area	28.29 dv	12.28 dv
Shenandoah National Park	28.32 dv	10.93 dv
Shining Rock National Wilderness Area	28.13 dv	7.70 dv
Sipsey National Wilderness Area	27.69 dv	15.57 dv
St. Marks National Wilderness Area	24.68 dv	14.34 dv
Swanquarter National Wilderness Area	23.79 dv	12.34 dv
Wolf Island National Wilderness Area	25.34 dv	15.23 dv

2.4.2. Pollutant Contributions to Visibility Impairment (2000-2004 Baseline Data)

The 20% most impaired visibility days at Chassahowitzka, St. Marks, and Everglades during the baseline period occurred throughout the year, with sulfate being the largest component. To illustrate this, Figure 2-1, Figure 2-2, and Figure 2-3 display the 2000(1) – 2004 reconstructed extinction for the 20% most impaired days for Chassahowitzka, Everglades, and St. Marks, respectively. Similar plots for the other VISTAS Class I areas can be found in Appendix C. During the baseline period, the peak visibility impairment days occur in the summer under stagnant weather conditions with high relative humidity, high temperatures, and low wind speeds. Likewise, the 20% clearest days in Florida can occur at any time of year.

[12] URL: https://www.epa.gov/sites/production/files/2020-06/documents/memo_data_for_regional_haze_technical_addendum.pdf

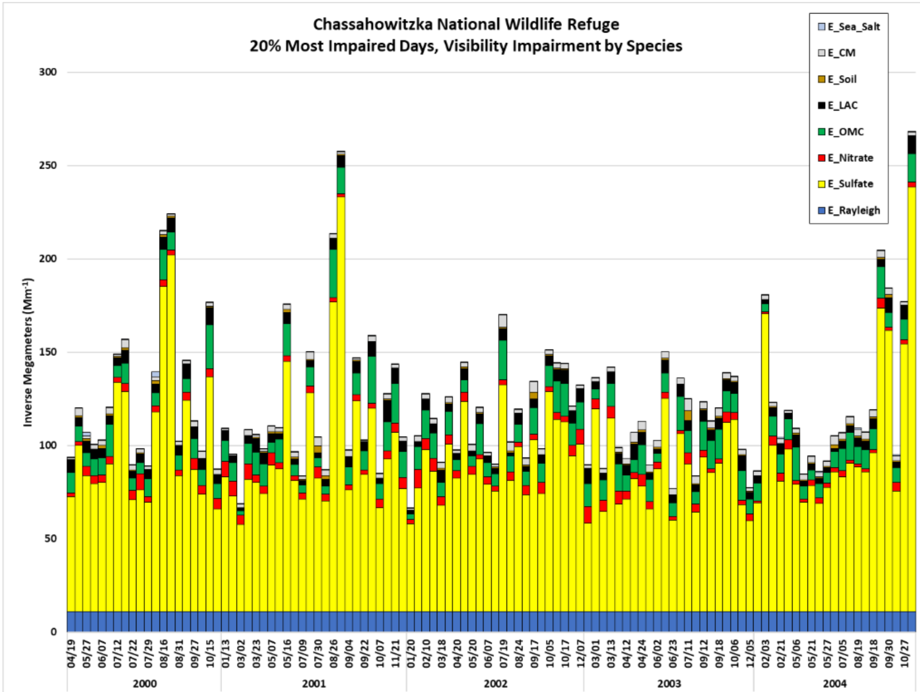

Figure 2-1: 2000-2004 Reconstructed Extinction for the 20% Most Impaired Days at Chassahowitzka

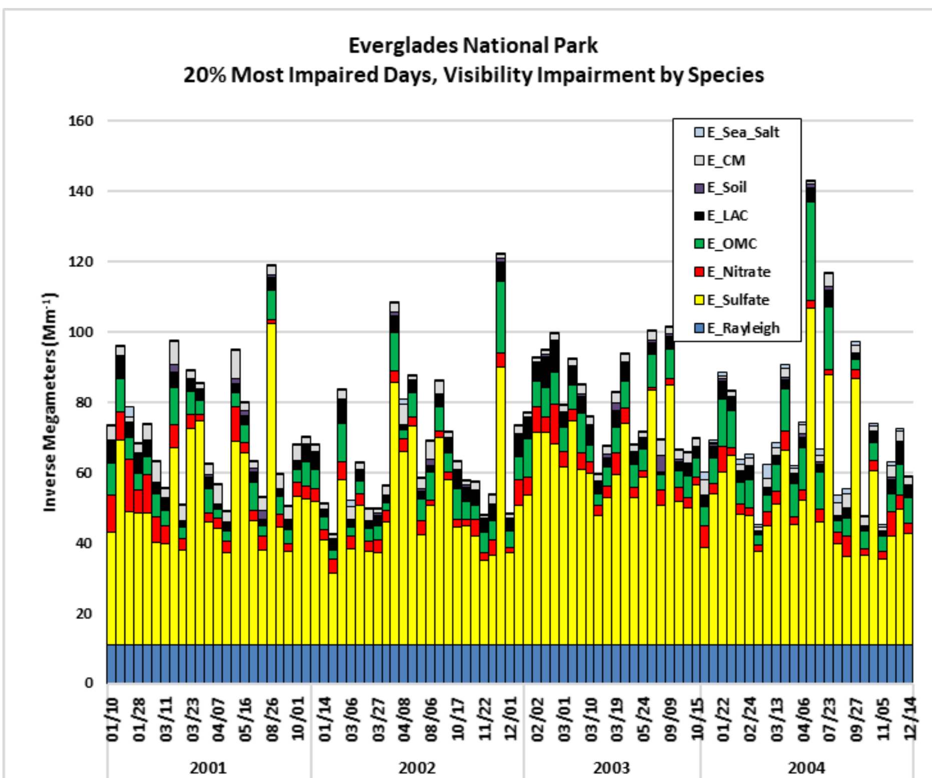

Figure 2-2: 2001-2004 Reconstructed Extinction for the 20% Most Impaired Days at Everglades

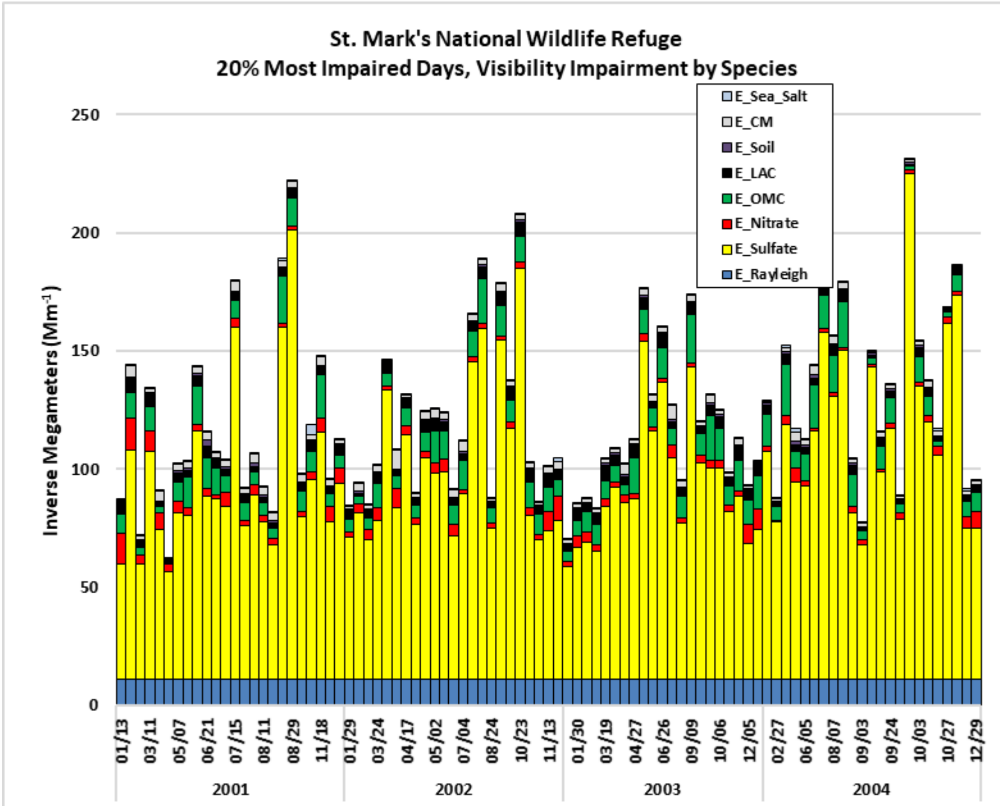

Figure 2-3: 2001-2004 Reconstructed Extinction for the 20% Most Impaired Days at St. Marks

Figure 2-4 displays the average light extinction for the 20% most impaired days during the baseline period (2000-2004) for each VISTAS Class I area and for nearby Class I areas. Figure 2-5 displays the average light extinction for the 20% clearest during the baseline period (2000-2004) for each VISTAS Class I area and for nearby Class I areas.

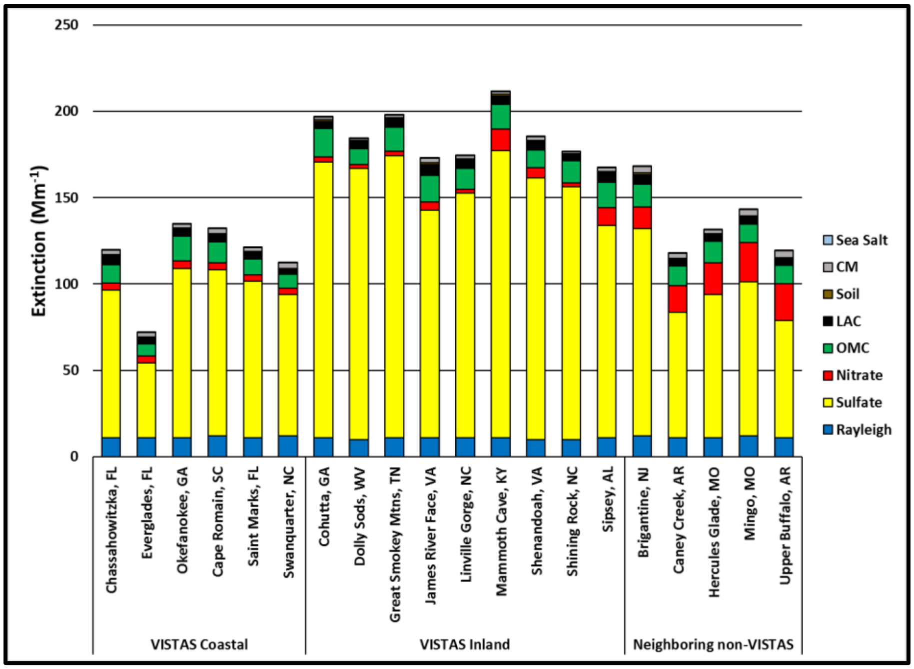

Figure 2-4: Average Light Extinction, 20% Most Impaired Days, 2000-2004, VISTAS and Neighboring Class I Areas

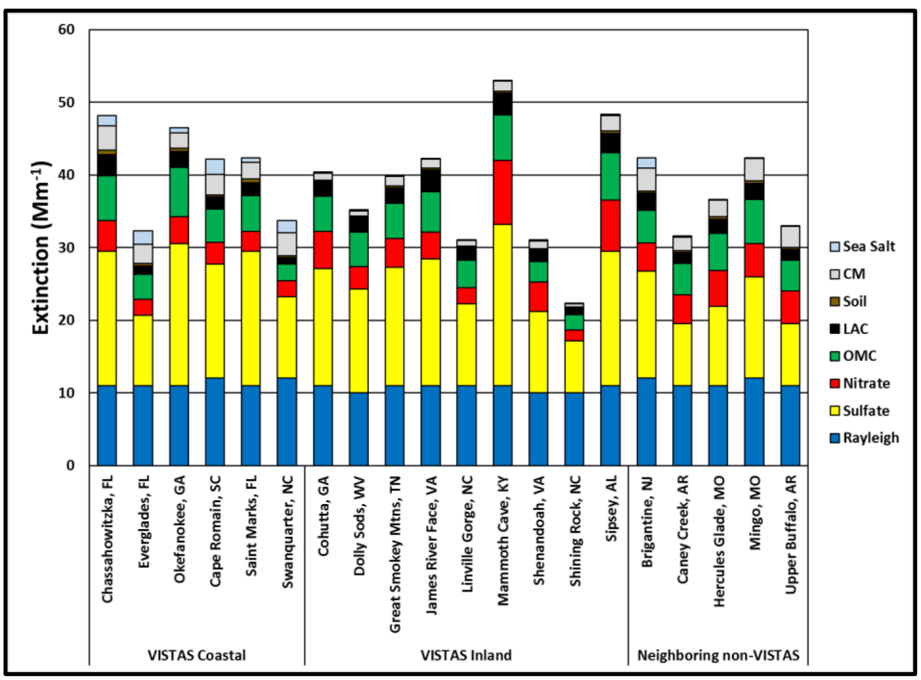

Figure 2-5: Average Light Extinction, 20% Clearest Days, 2000-2004, VISTAS and Neighboring Class I Areas

These bar charts (Figure 2-1, Figure 2-2, Figure 2-3, Figure 2-4, and Figure 2-5) are based on the IMPROVE data file called sia_impairment_daily_budgets_10_18.zip and therefore have not been updated with the patching and substitution algorithms described in EPA's June 3, 2020, guidance memorandum entitled, "Recommendation for the Use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program."[13] Changes to the daily data from the application of these routines is expected to be slight and will not change the conclusions of this SIP.

Ammonium sulfate, $(NH_4)_2SO_4$, is the most important contributor to visibility impairment and fine particle mass on the 20% most impaired and 20% clearest visibility days at all the Class I areas during the baseline period. During this period, sulfate levels on the 20% most impaired days accounted for 75% to 90% of anthropogenically-driven visibility impairment. Sulfate particles are formed in the atmosphere from SO_2 emissions. Sulfate particles occur as hydrogen sulfate; H_2SO_4; ammonium bisulfate, HNH_4SO_4; and ammonium sulfate, $(NH_4)_2SO_4$, depending on the availability of ammonia, NH_3, in the atmosphere.

Across the VISTAS region, sulfate levels are higher at the Southern Appalachian sites than at the coastal sites (Figure 2-4). On the 20% clearest days, sulfate levels are more uniform across the region (Figure 2-5).

The best average visibility and lowest sulfate values on the clearest days occurred at Shining Rock. Shining Rock, at 1621 meters elevation, and is likely influenced on the clearest days by regional transport of air masses above the boundary layer.

Particulate Organic Matter (POM) is shown as organic matter carbon (OMC) in the figures. POM is the second most important contributor to fine particle mass and light extinction on the 20% most impaired and the 20% clearest days at the Florida Class I areas during the baseline period. Days for which visibility impairment is associated with elevated levels of POM and elemental carbon are associated with natural events such as wildland fires and are largely removed from the 20% most impaired days because they are regarded as natural sources. Significant fire impacts are infrequent at Class I areas in Florida. In the fall, winter, and spring, more of the carbon is attributable to wood burning while in the summer months more of the carbon mass is attributable to biogenic emissions from vegetation.

Ammonium nitrate (NH_4NO_3) is formed in the atmosphere by reaction of ammonia (NH_3) and NO_X. In the VISTAS region, nitrate formation is limited by availability of ammonia and by temperature. Ammonia preferentially reacts with SO_2 and sulfate before reacting with NO_X. Particle nitrate is formed at lower temperatures; at elevated temperatures nitric acid remains in gaseous form. For this reason, particle nitrate levels are very low in the summer and a minor contributor to visibility impairment during the baseline period of 2000-2004. Particle nitrate

[13] URL: https://www.epa.gov/visibility/memo-and-technical-addendum-ambient-data-usage-and-completeness-regional-haze-program

concentrations are higher on winter days and are more important for the coastal sites where the 20% most impaired days occur during the winter months.

Elemental Carbon (EC) is shown as light absorbing carbon (LAC) in this section's figures. EC is a comparatively minor contributor to visibility impairment in the baseline period. Sources include agriculture, prescribed, wildland, and wildfires and incomplete combustion of fossil fuels. EC levels are higher at urban monitors than at the Class I areas and suggest controls of primary PM at fossil fuel combustion sources would be more effective to reduce $PM_{2.5}$ in urban areas than to improve visibility in Class I areas

Soil fine particles are minor contributors to visibility impairment at most southeastern sites on most days in the baseline period. Occasional episodes of elevated fine soil can be attributed to Saharan dust episodes, particularly at Everglades, but rarely are seen in other VISTAS Class I areas; these contributions are now largely teased out as natural routine events. Due to its small contribution to anthropogenic visibility impairment in southeastern Class I areas, fine soil control strategies to improve visibility would not be effective.

Sea salt (NaCl) is observed at the coastal sites. During the baseline period, sea salt contributions to visibility impairment are most important on the 20% clearest days when sulfate and POM levels are low. Sea salt levels do not contribute significantly to visibility on the 20% most impaired visibility days. The new IMPROVE equation uses Chloride ion, Cl^-, from routine IMPROVE measurements to calculate sea salt levels. VISTAS used Cl^- to calculate sea salt contributions to visibility following IMPROVE guidance.

Coarse mass (CM) are particles with diameters between 2.5 and 10 microns. This component has a relatively small contribution to visibility impairment because the light extinction efficiency of coarse mass is very low compared to the extinction efficiency for sulfate, nitrate, and carbon.

Rayleigh scattering is the scattering of sunlight off the molecules of the atmosphere and varies with the elevation of the monitoring site. For VISTAS monitoring sites, this value varies from 10 to 12 Mm^{-1}.

2.5. Modeling Base Period (2009-2013)

Visibility projections discussed in Sections 5, 6, and 7 use IMPROVE data from 2009-2013 to estimate future year visibility at Class I areas. For each Class I area, estimated anthropogenic impairment observations from each IMPROVE site for the five-year period surrounding the 2011 modeling base year comprise the data representing the modeling base period. The year 2011 was selected as the modeling base year because the VISTAS 2028 emissions inventory is based on the 2011 Version 6 EPA modeling platform. For the analyses in this SIP, this period consists of those years surrounding 2011 (i.e. 2009-2013). While not required by the regional haze regulation, examination of these data provides insight into the future year visibility projections for the VISTAS Class I areas

2.5.1. Modeling Base Period (2009-2013) for 20% Clearest and 20% Most Impaired Days for VISTAS Class I Areas

Table 2-4 provides a summary of the conditions for the 20% clearest and 20% most impaired days at VISTAS Class I areas during 2009-2013, the period used as the modeling basis for this SIP revision's projection analysis described in Sections 5, 6, and 7. The baseline light extinction and dv index values for the 20% most impaired and 20% clearest days at the Class I areas are based on data and calculations included in Appendix E-6 of this SIP.

Table 2-4: Modeling Base Period (2009-2013) Conditions for VISTAS Class I Areas

Class I Areas	Average for 20% Most Impaired Days	Average for 20% Clearest Days
Cape Romain National Wilderness Area	21.48 dv	13.59 dv
Chassahowitzka National Wilderness Area	19.96 dv	13.76 dv
Cohutta Wilderness Area	21.19 dv	10.94 dv
Dolly Sods Wilderness Area	21.59 dv	9.03 dv
Everglades National Park	16.30 dv	11.23 dv
Great Smoky Mountains National Park	21.39 dv	10.63 dv
James River Face Wilderness Area	21.37 dv	11.79 dv
Joyce Kilmer-Slickrock Wilderness Area	21.39 dv	10.63 dv
Linville Gorge Wilderness Area	20.39 dv	9.70 dv
Mammoth Cave National Park	24.04 dv	13.69 dv
Okefenokee National Wilderness Area	20.70 dv	13.34 dv
Otter Creek Wilderness Area	21.59 dv	9.03 dv
Shenandoah National Park	20.72 dv	8.60 dv
Shining Rock Wilderness Area*	20.39 dv	9.70 dv
Sipsey Wilderness Area	21.67 dv	12.84 dv
St. Marks National Wilderness Area	20.11 dv	13.34 dv
Swanquarter National Wilderness Area	19.76 dv	11.76 dv
Wolf Island National Wilderness Area	20.70 dv	13.34 dv

* The IMPROVE monitoring data at Shining Rock Wilderness Area is missing complete data for 2010 and 2011. After consultation with North Carolina, a three-year average of 2009, 2012, and 2013 IMPROVE data was used to calculate the visibility (dv) for both the 20% clearest and 20% most impaired days at Shining Rock.

2.5.2. Pollutant Contributions to Visibility Impairment (2009-2013 Modeling Base Period Data)

Figure 2-6 shows the 2009 – 2013 reconstructed extinction for the 20% most impaired days for Chassahowitzka. Similar plots for the other Florida and nearby Class I areas can be found in Appendix C. During the modeling base period, the peak visibility impairment days continue to occur in the summer although winter episodes became more prevalent. On nearly all days, sulfate continues to be the dominant visibility impairing pollutant. Nitrate impacts become more significant on some of the 20% most impaired days. The figure also shows the improvement in visibility impairment when compared to Figure 2-1. While maximum values in Figure 2-1 are in the range of 250 Mm^{-1}, maximum values in Figure 2-6 are in the 180 Mm^{-1} range, highlighting the impact of the many control programs implemented during the intervening period.

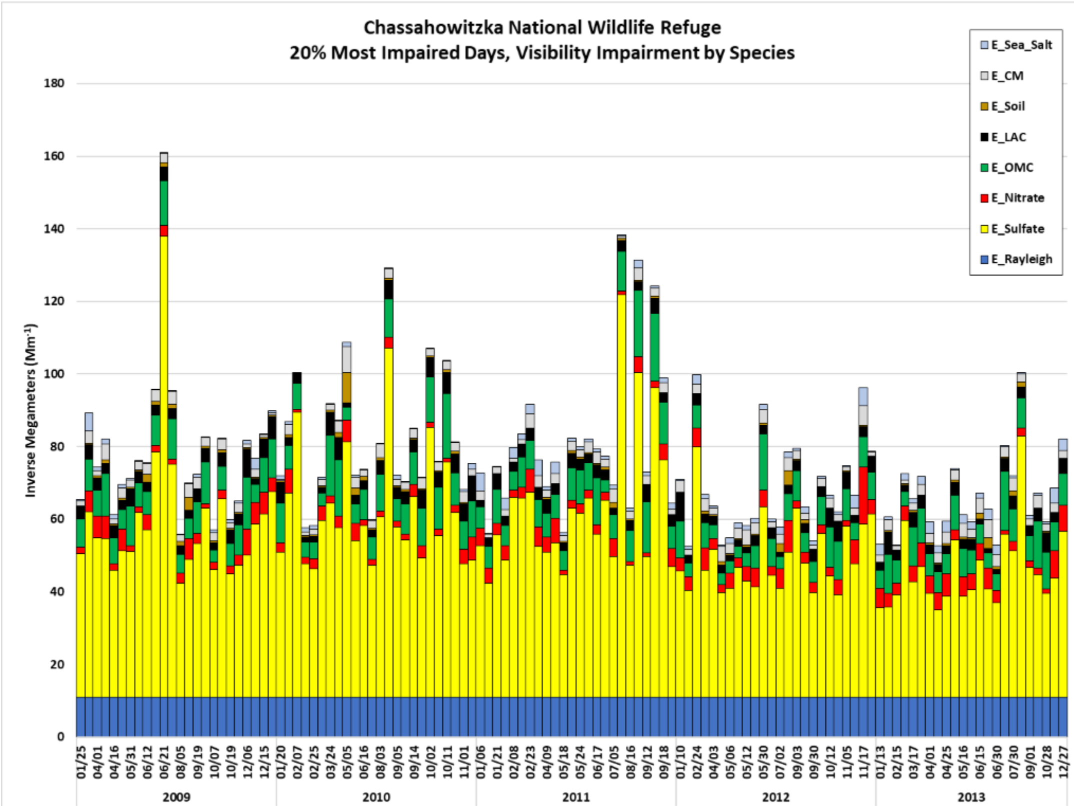

Figure 2-6: 2009-2013 Reconstructed Extinction for the 20% Most Impaired Days at Chassahowitzka

Figure 2-7 displays the average light extinction for the 20% most impaired days during the modeling base period (2009-2013) for each VISTAS Class I area and for nearby Class I areas. Figure 2-7 shows that for the VISTAS Class I areas, sulfate continues to be the driver for 20% worst visibility days. In all VISTAS Class I areas except Mammoth Cave, organic matter is the second leading cause of visibility impairment on average during 20% most impaired days. In neighboring Class I areas and at Mammoth Cave, nitrate is the second leading cause of visibility impairment on average 20% most impaired days.

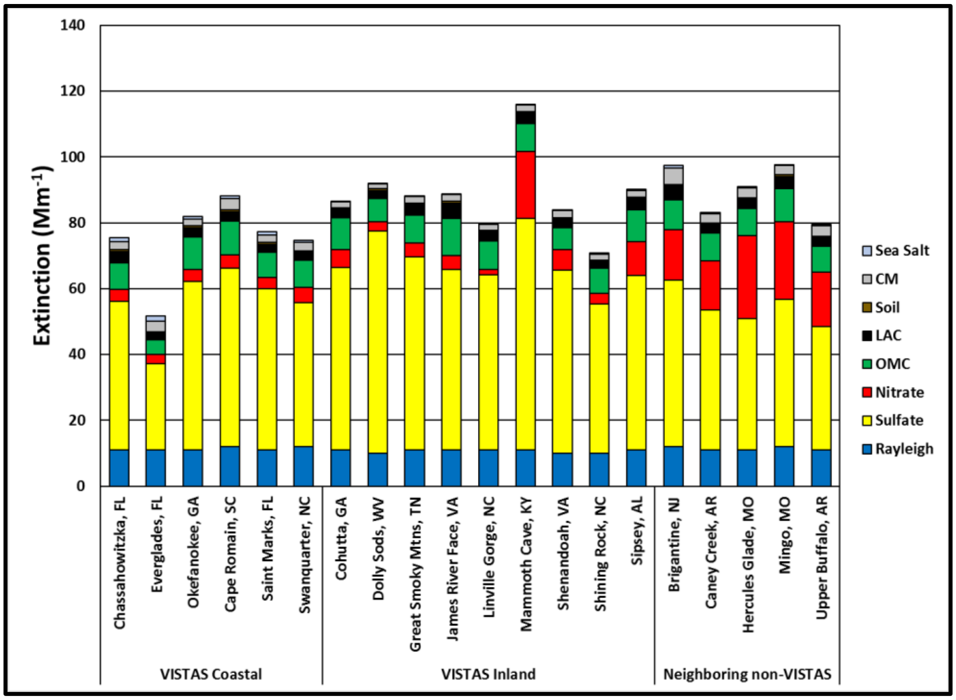

Figure 2-7: Average Light Extinction, 20% Most Impaired Days, 2009-2013, VISTAS and Neighboring Class I Areas

Figure 2-8 displays the average light extinction for the 20% clearest days during the modeling base period (2009-2013) for each VISTAS Class I area and for nearby Class I areas. On the 20% clearest days, sulfate continues to be the main component of visibility impairing pollution for VISTAS and nearby Class I areas. Comparison to Figure 2-5 shows that no degradation of visibility occurs between the 2000-2004 and 2009-2013 data sets, and in most cases improvement on 20% clearest days occurs.

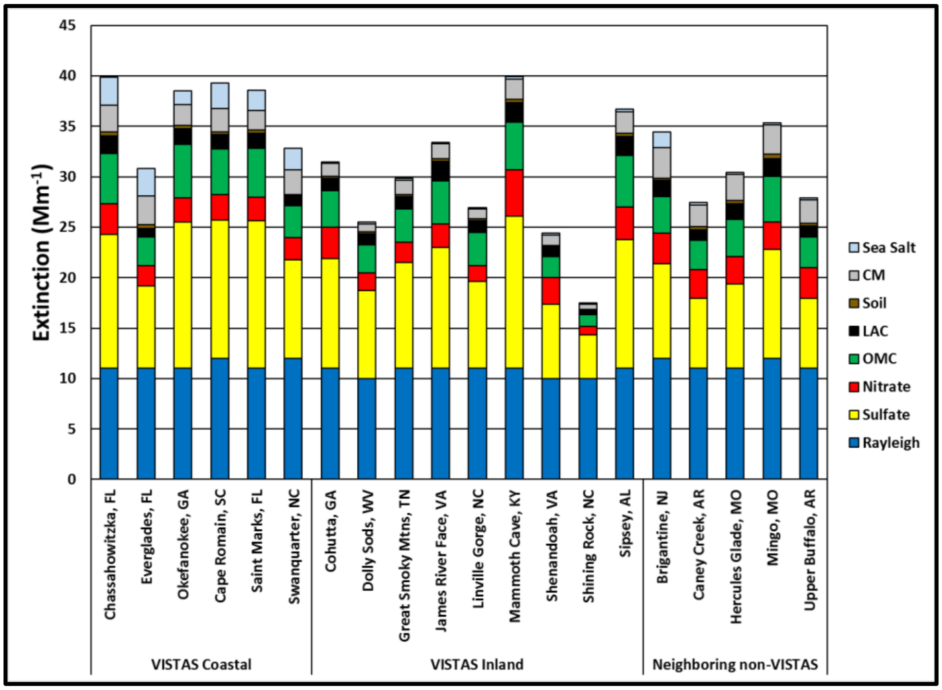

Figure 2-8: Average Light Extinction, 20% Clearest Days, 2009-2013, VISTAS and Neighboring Class I Areas

These bar charts (Figure 2-6, Figure 2-7, and Figure 2-8) are based on the IMPROVE data file called sia_impairment_daily_budgets_10_18.zip and therefore have not been updated with the patching and substitution algorithms described in EPA's 2020 guidance memo. Changes to the daily data from the application of these routines is expected to be slight and will not change the conclusions of this SIP.

2.6. Current Conditions

The current visibility estimates are comprised of measurements from the five-year period between 2014 and 2018, inclusive.

2.6.1. Current Conditions (2014-2018) for 20% Clearest and 20% Most Impaired Days for VISTAS Class I Areas

Table 2-5 provides a summary of the current conditions (2014-2018) for the 20% clearest and 20% most impaired days at VISTAS Class I areas. These data reflect values included in Table 1 on the EPA memorandum with subject: Technical addendum including updated visibility data through 2018 for the memo titled, "Recommendation for the use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program."[14]

[14] URL: https://www.epa.gov/sites/production/files/2020-06/documents/memo_data_for_regional_haze_technical_addendum.pdf

Table 2-5: Current Conditions (2014-2018) for VISTAS Class I Areas

Class I Areas	Average for 20% Most Impaired Days	Average for 20% Clearest Days
Cape Romain National Wilderness Area	17.67 dv	11.80 dv
Chassahowitzka National Wilderness Area	17.41 dv	12.41 dv
Cohutta Wilderness Area	17.37 dv	8.10 dv
Dolly Sods Wilderness Area	17.65 dv	6.68 dv
Everglades National Park	14.90 dv	10.37 dv
Great Smoky Mountains National Park	17.21 dv	8.35 dv
James River Face Wilderness Area	17.89 dv	9.47 dv
Joyce Kilmer-Slickrock Wilderness Area	17.21 dv	8.35 dv
Linville Gorge Wilderness Area	16.42 dv	7.61 dv
Mammoth Cave National Park	21.02 dv	11.31 dv
Okefenokee National Wilderness Area	17.39 dv	11.57 dv
Otter Creek Wilderness Area	17.65 dv	6.68 dv
Shenandoah National Park	17.07 dv	6.85 dv
Shining Rock Wilderness Area*	15.49 dv	4.40 dv
Sipsey National Wilderness Area	19.03 dv	10.75 dv
St. Marks National Wilderness Area	17.39 dv	11.15 dv
Swanquarter National Wilderness Area	16.30 dv	10.61 dv
Wolf Island National Wilderness Area	17.39 dv	11.57 dv

2.6.2. Pollutant Contributions to Visibility Impairment (2014-2018 Current Data)

Figure 2-9, Figure 2-10, and Figure 2-11 display the 2014 – 2018 reconstructed extinction for the 20% most impaired days for Chassahowitzka, Everglades, and St. Marks, respectively. Similar plots for the other VISTAS Class I areas can be found in Appendix C. For the VISTAS region and neighboring Class I areas, Figure 2-12 and Figure 2-13 show light extinction averaged from 2014-2018 IMPROVE data for the 20% most impaired and clearest days, respectively. These bar charts (Figure 2-9, through Figure 2-13) are based on the IMPROVE data file called sia_impairment_daily_budgets_10_18.zip for data through 2017. For 2018 data, the IMPROVE data file called sia_impairment_daily_budgets_4_20_2.zip was used. Therefore, the data through 2017 have not been updated with the patching and substitution algorithms described in EPA's 2020 guidance memo. Changes to the daily data from the application of these routines are expected to be slight and will not change the conclusions of this SIP.

These figures continue to demonstrate improved visibility when compared to the 2009-2013 data or the 2000-2004 data. Emissions of SO_2 and other visibility impairing pollutants are reducing, as discussed in Section 13, and these reductions are resulting in better visibility.

Figure 2-12 presents average data for 20% most impaired days and shows that on average sulfate continues to be the predominant visibility impairing pollutant. However, the data in Figure 2-9 through Figure 2-11, which are daily monitoring values, show that occasionally nitrate is the predominant visibility impairing pollutant on certain days, generally in winter months.

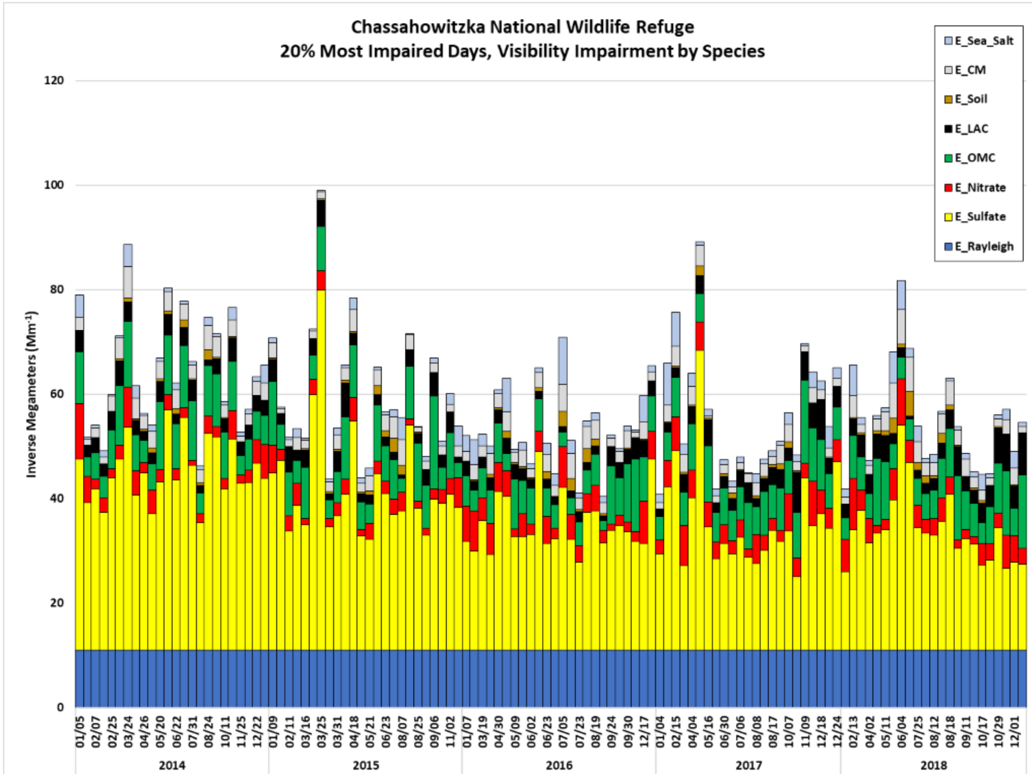

Figure 2-9: 2014-2018 Reconstructed Extinction for the 20% Most Impaired Days at Chassahowitzka

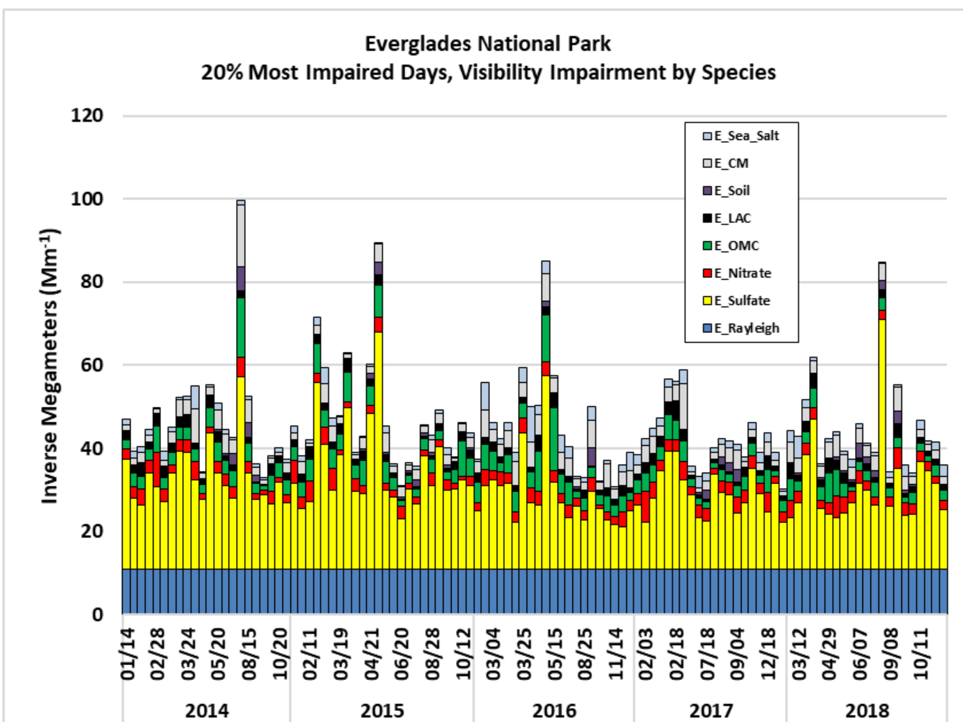

Figure 2-10: 2014-2018 Reconstructed Extinction for the 20% Most Impaired Days at Everglades

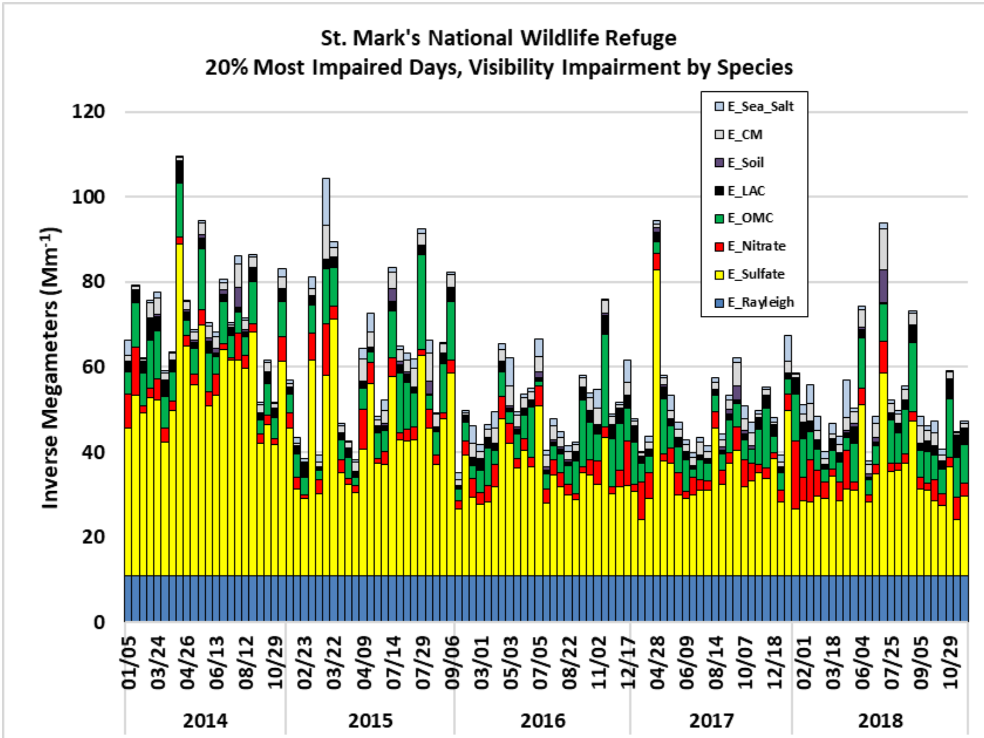

Figure 2-11: 2014-2018 Reconstructed Extinction for the 20% Most Impaired Days at St. Marks

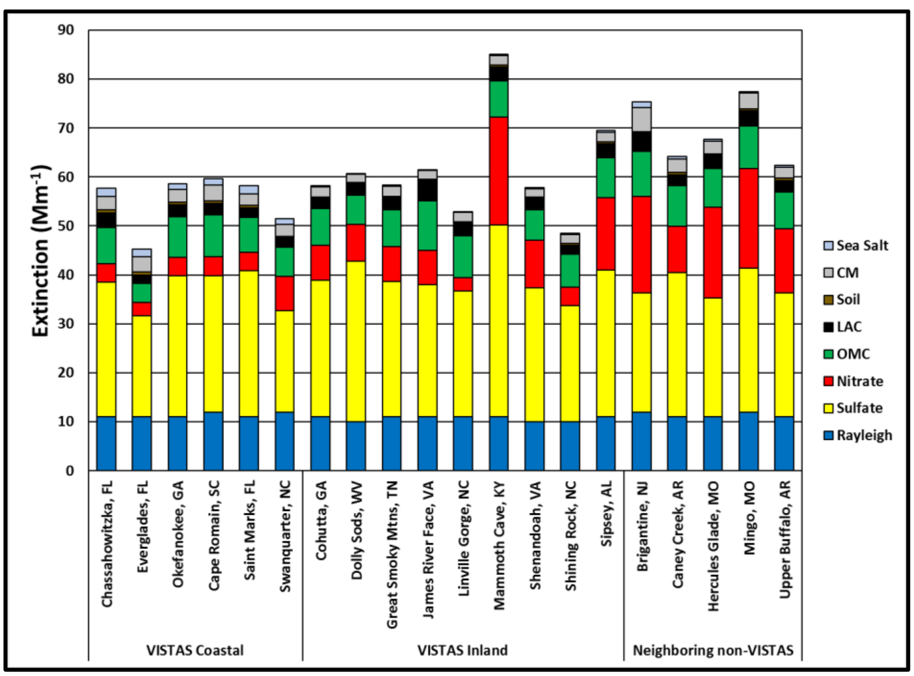

Figure 2-12: Average Light Extinction, 20% Most Impaired Days, 2014-2018, VISTAS and Neighboring Class I Areas

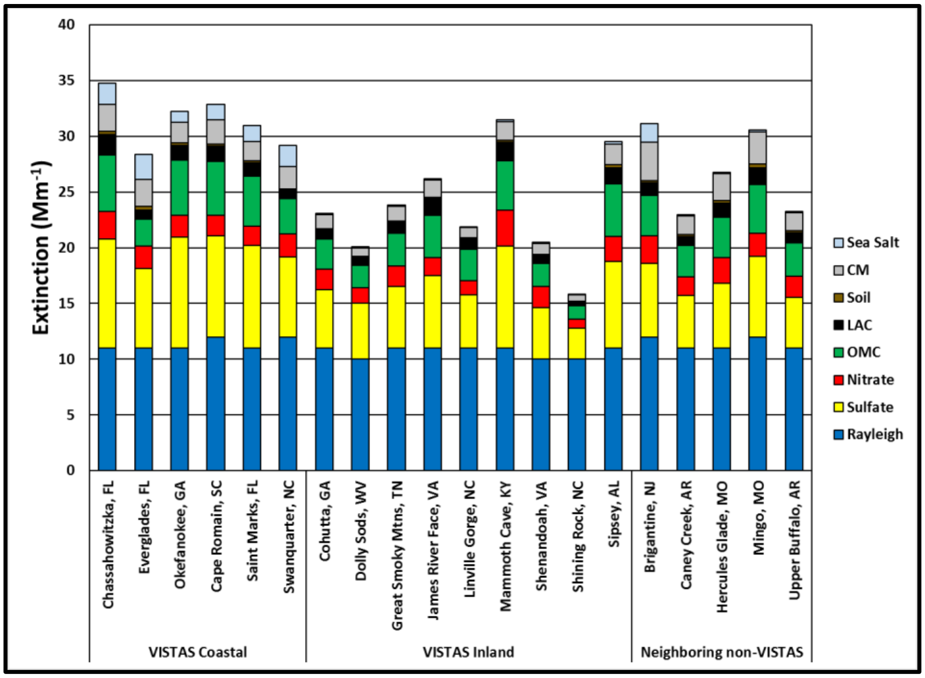

Figure 2-13: Average Light Extinction, 20% Clearest Days, 2014-2018, VISTAS and Neighboring Class I Areas

2.7. Comparisons of Baseline, Current, and Natural Background Visibility

The Regional Haze Rule requires that SIPs include an evaluation of progress made since the baseline period toward improving visibility on the 20% most impaired days and 20% clearest days for each state's Class I areas (40 CFR 51.308(f)(1)(iv)). The rule also requires that the SIP enumerate the deciview value by which the current visibility condition exceeds the natural visibility condition, for each state's Class I areas on the 20% most impaired days and the 20% clearest days (40 CFR 51.308(f)(1)(v)). Table 2-6 summarizes this data for each Class I area located in VISTAS for the 20% most impaired days. On 20% most impaired days, data for current conditions show that significant progress has been made as compared to baseline conditions. In many cases, the improvement in visibility from baseline conditions demonstrated by the 2014-2018 visibility data is more than half of the improvement needed to achieve natural conditions.

Table 2-6: Comparison of Baseline, Current, and Natural Conditions for 20% Most Impaired Days

Class I Areas	2000-2004 Baseline Conditions	2014-2018 Current Conditions	Change in Visibility, Baseline to Current	Natural Background Conditions	Difference Between Current Conditions and Natural Background
Cape Romain Wilderness Area	25.25 dv	17.67 dv	7.58 dv	9.79 dv	7.88 dv
Chassahowitzka Wilderness Area	24.52 dv	17.41 dv	7.11 dv	9.03 dv	8.38 dv
Cohutta Wilderness Area	29.12 dv	17.37 dv	11.75 dv	9.88 dv	7.49 dv
Dolly Sods Wilderness Area	28.29 dv	17.65 dv	10.64 dv	8.92 dv	8.73 dv
Everglades National Park	19.52 dv	14.90 dv	4.62 dv	8.33 dv	6.57 dv

Class I Areas	2000-2004 Baseline Conditions	2014-2018 Current Conditions	Change in Visibility, Baseline to Current	Natural Background Conditions	Difference Between Current Conditions and Natural Background
Great Smoky Mountains National Park	29.11 dv	17.21 dv	11.90 dv	10.05 dv	7.16 dv
James River Face Wilderness Area	28.08 dv	17.89 dv	10.19 dv	9.47 dv	8.42 dv
Joyce Kilmer-Slickrock Wilderness Area	29.11 dv	17.21 dv	11.90 dv	10.05 dv	7.16 dv
Linville Gorge Wilderness Area	28.05 dv	16.42 dv	11.63 dv	9.70 dv	6.72 dv
Mammoth Cave National Park	29.83 dv	21.02 dv	8.81 dv	9.80 dv	11.22 dv
Okefenokee Wilderness Area	25.34 dv	17.39 dv	7.95 dv	9.45 dv	7.94 dv
Otter Creek Wilderness Area	28.29 dv	17.65 dv	10.64 dv	8.92 dv	8.73 dv
Shenandoah National Park	28.32 dv	17.07 dv	11.25 dv	9.52 dv	7.55 dv
Shining Rock Wilderness Area	28.13 dv	15.49 dv	12.64 dv	10.25 dv	5.24 dv
Sipsey Wilderness Area	27.69 dv	19.03 dv	8.66 dv	9.62 dv	9.41 dv
St. Marks Wilderness Area	24.68 dv	17.39 dv	7.29 dv	9.13 dv	8.26 dv
Swanquarter Wilderness Area	23.79 dv	16.30 dv	7.49 dv	10.01 dv	6.29 dv
Wolf Island Wilderness Area	25.34 dv	17.39 dv	7.95 dv	9.45 dv	7.94 dv

Table 2-7 summarizes this data for each Class I area located in VISTAS for the 20% clearest days. On 20% clearest days, data for current conditions show that visibility on these days has improved from the baseline conditions for all VISTAS Class I areas.

Table 2-7: Comparison of Baseline, Current, and Natural Conditions for 20% Clearest Days

Class I Areas	2000-2004 Baseline Conditions	2014-2018 Current Conditions	Change in Visibility, Baseline to Current	Natural Background Conditions	Difference Between Current Conditions and Natural Background
Cape Romain Wilderness Area	14.29 dv	11.801 dv	2.49 dv	5.93 dv	5.87 dv
Chassahowitzka Wilderness Area	15.60 dv	12.41 dv	3.19 dv	6.00 dv	6.41 dv
Cohutta Wilderness Area	13.73 dv	8.10 dv	5.63 dv	4.42 dv	3.68 dv
Dolly Sods Wilderness Area	12.28 dv	6.68 dv	5.60 dv	3.64 dv	3.04 dv
Everglades National Park	11.69 dv	10.37 dv	1.32 dv	5.22 dv	5.15 dv
Great Smoky Mountains National Park	13.58 dv	8.35 dv	5.23 dv	4.62 dv	3.73 dv
James River Face Wilderness Area	14.21 dv	9.47 dv	4.74 dv	4.39 dv	5.08 dv
Joyce Kilmer-Slickrock Wilderness Area	13.58 dv	8.35 dv	5.23 dv	4.62 dv	3.73 dv
Linville Gorge Wilderness Area	11.11 dv	7.61 dv	3.50 dv	4.07 dv	3.54 dv
Mammoth Cave National Park	16.51 dv	11.31 dv	5.20 dv	5.00 dv	6.31 dv
Okefenokee Wilderness Area	15.23 dv	11.57 dv	3.66 dv	5.43 dv	6.14 dv
Otter Creek Wilderness Area	12.28 dv	6.68 dv	5.60 dv	3.64 dv	3.04 dv
Shenandoah National Park	10.96 dv	6.85 dv	4.11 dv	3.15 dv	3.70 dv
Shining Rock Wilderness Area	7.70 dv	4.40 dv	3.30 dv	2.49 dv	1.91 dv
Sipsey Wilderness Area	15.57 dv	10.76 dv	4.81 dv	5.03 dv	5.73 dv
St. Marks Wilderness Area	14.34 dv	11.15 dv	3.19 dv	5.37 dv	5.78 dv
Swanquarter Wilderness Area	12.34 dv	10.61 dv	1.73 dv	5.71 dv	4.90 dv
Wolf Island Wilderness Area	15.23 dv	11.57 dv	3.66 dv	5.43 dv	6.14 dv

3. Glide Paths to Natural Conditions in 2064

In accordance with 40 CFR 51.308(f)(1)(vi)(A), each state must calculate a uniform rate of progress (URP), also known as a "glide path", for each mandatory federal Class I area located within their state. States must analyze and determine the consistent rate of progress over time. Starting with the baseline period of 2000-2004, states must analyze and determine the consistent rate of progress over time. States must compare the baseline visibility conditions (2000-2004) for the most impaired days to the natural visibility condition for the most impaired days to determine the uniform rate of visibility improvements needed to attain the natural visibility conditions by the end of 2064.

Glide paths were developed for each mandatory federal Class I area in the VISTAS region. The glide paths were developed in accordance with the EPA's guidance for tracking progress[15] and used data collected from the IMPROVE monitoring sites as described in Section 2 of this document. Glide paths are one of the indicators used in setting reasonable progress goals.

Figure 3-1, Figure 3-2, and Figure 3-3 show the glide path for the 20% most impaired days for Chassahowitzka, Everglades, and St. Marks assuming a uniform rate of progress toward natural conditions. Natural background visibility for the most impaired days at Chassahowitzka, Everglades, and St. Marks are calculated to be 9.03 dv, 8.33dv, and 9.13 dv respectively.

The data in Figure 3-1, Figure 3-2, and Figure 3-3 is derived from Table 1 in the EPA memorandum with subject: Technical addendum including updated visibility data through 2018 for the memo titled, "Recommendation for the use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program."[16]

[15] URL: https://www.epa.gov/sites/production/files/2018-12/documents/technical_guidance_tracking_visibility_progress.pdf
[16] URL: https://www.epa.gov/sites/production/files/2020-06/documents/memo_data_for_regional_haze_technical_addendum.pdf

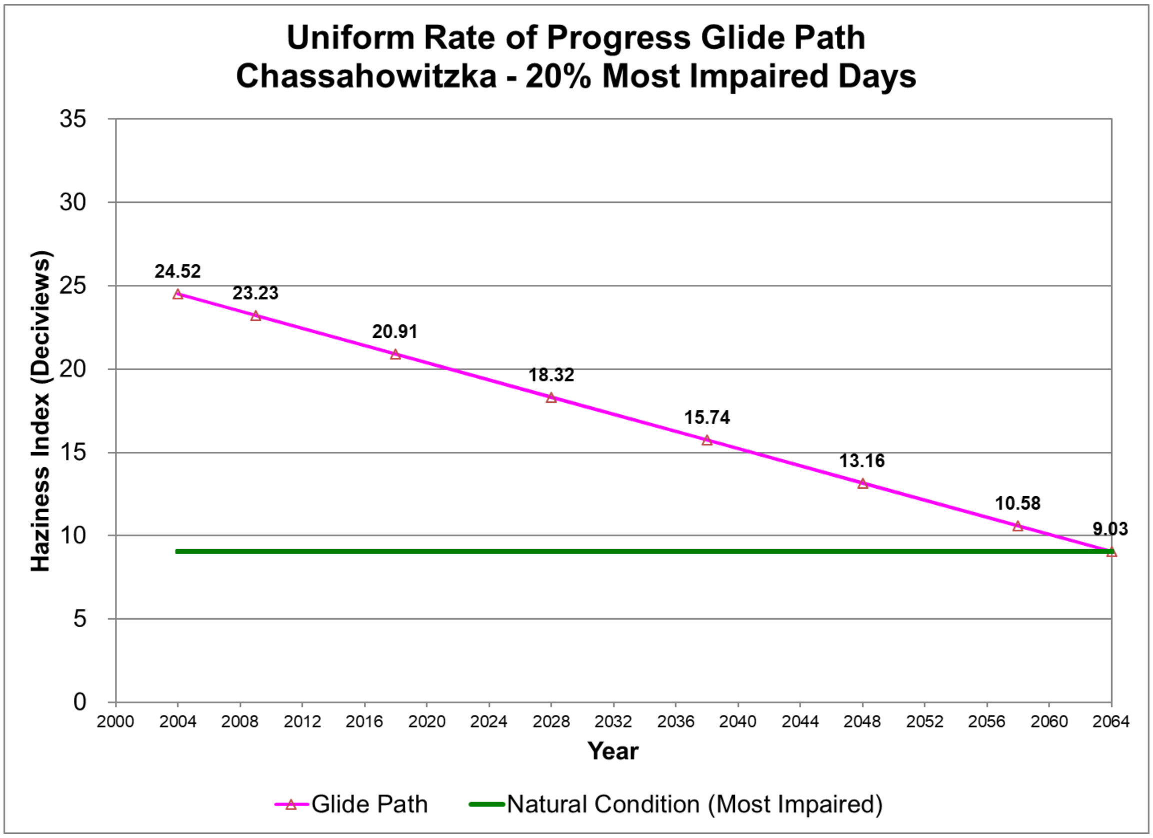

Figure 3-1: Uniform Rate of Progress Glide Path for 20% Most Impaired Days at Chassahowitzka

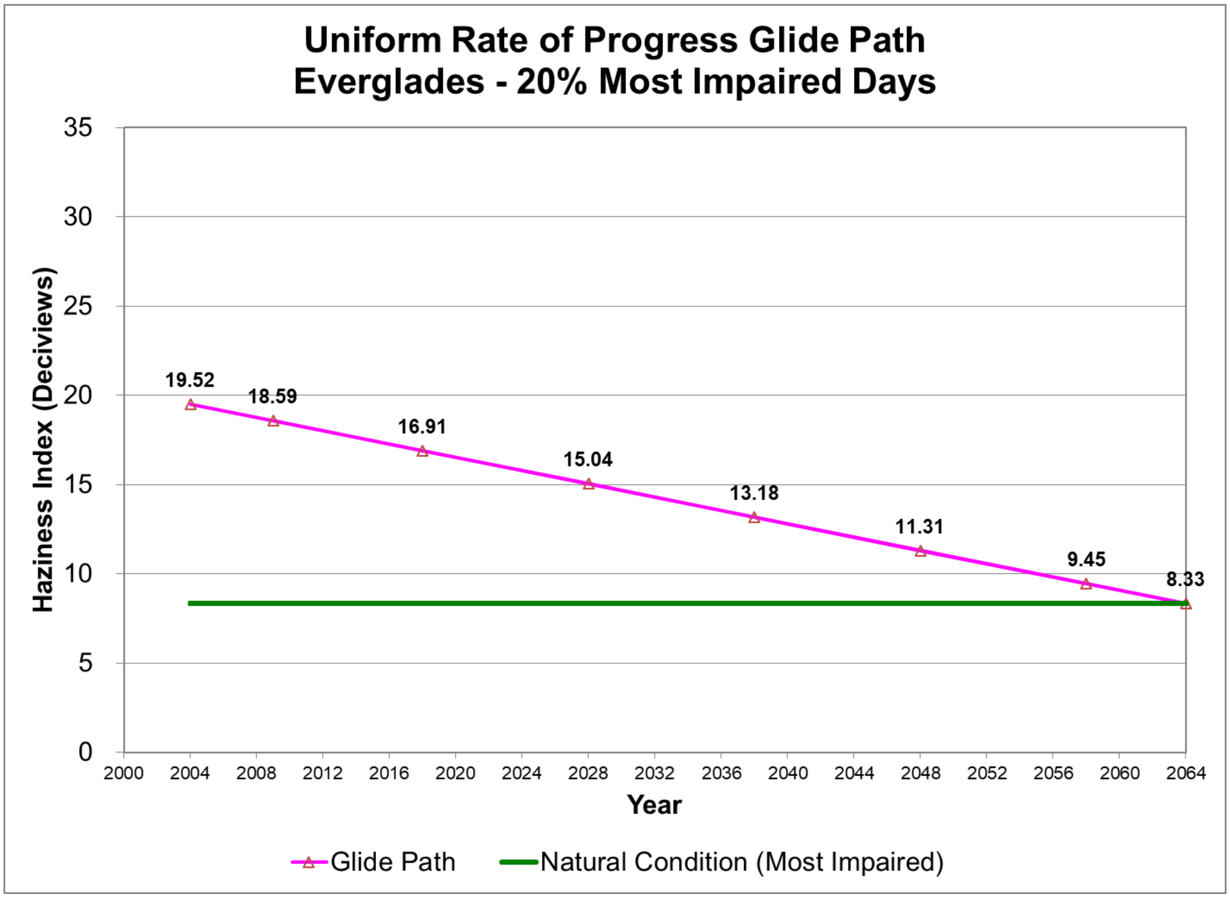

Figure 3-2: Uniform Rate of Progress Glide Path for 20% Most Impaired Days at Everglades

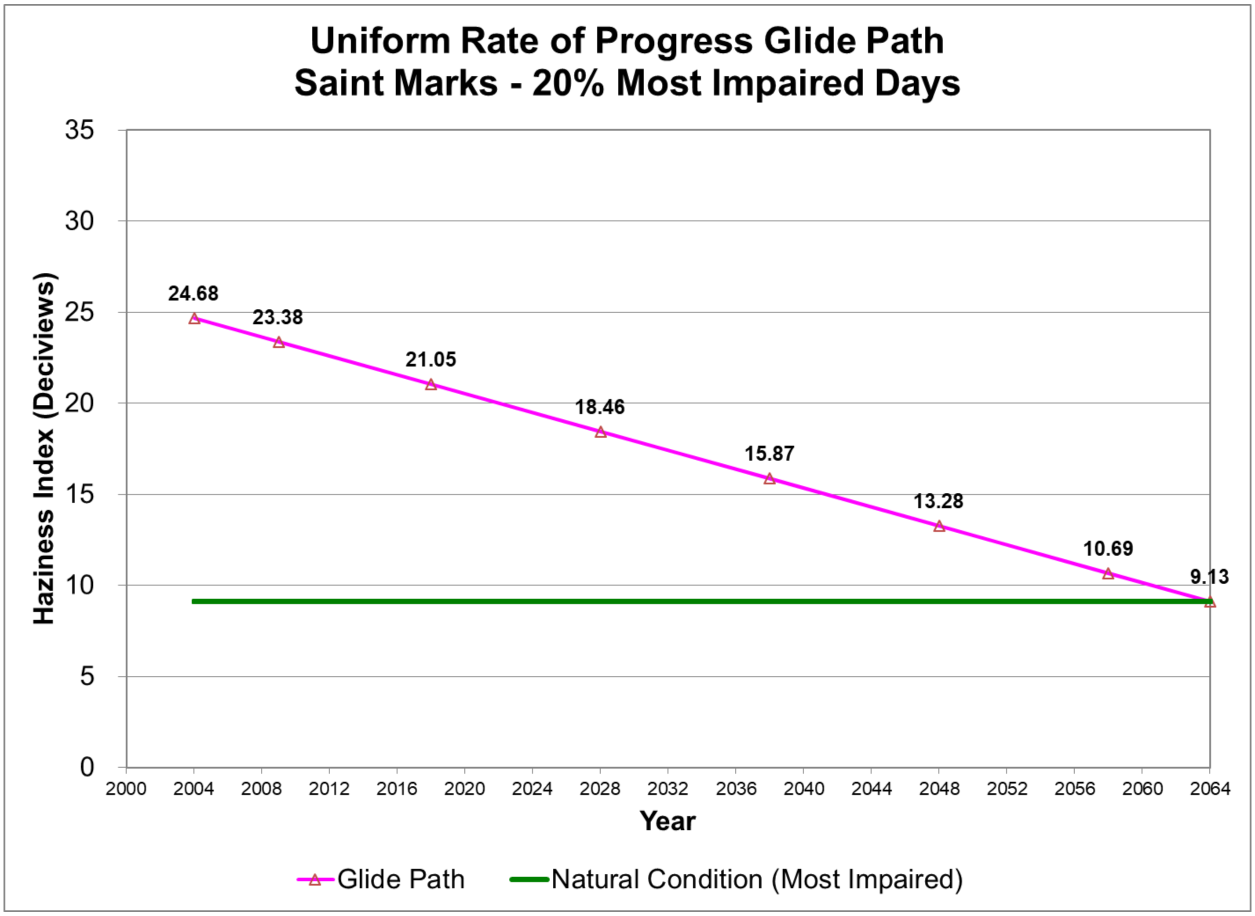

Figure 3-3: Uniform Rate of Progress Glide Path for 20% Most Impaired Days at St. Marks

4. Emission Inventories Used for Visibility Analyses

4.1. Baseline Emissions Inventory

The Regional Haze Rule at 40 CFR 51.308(f)(6)(v) requires a statewide emissions inventory of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I area. The inventory must include emissions for the most recent year for which data are available and estimates of future projected emissions. Florida complies with the Air Emission Reporting Requirements (AERR) by submitting the required triennial and annual data inventories to EPA. Section 13.5.1 shows NEI data for 2014 and 2017 and CAMD data for 2018 and 2019. The same Regional Haze Rule provision also requires States to commit to update the inventory periodically, which Florida commits to doing. This section describes how the projected emissions inventory for 2028 was developed, and Section 7.2.4 shows the 2028 projected emissions data. For the inventory, VISTAS used a baseline year of 2011 and projected future year of 2028. The emission inventories include carbon monoxide[17] (CO), volatile organic compounds (VOCs), NO_X, $PM_{2.5}$, coarse particulate matter (PM_{10}), NH_3, and SO_2.

VISTAS contracted with ERG to perform emission inventory work as part of the air quality modeling analysis. ERG was directed by VISTAS to use EPA's 2011el-based air quality modeling platform, which includes emissions, meteorology, and other inputs for 2011, as the base year for the modeling described in EPA's TSD entitled "Documentation for the EPA's Preliminary 2028 Regional Haze Modeling."[18] EPA has projected the 2011 base year emissions[19] to a 2028 future year base case scenario. These data were the foundation of the revised emissions used for this analysis as described elsewhere. The 2011 modeling platform and projected 2028 emissions were used to drive the 2011 base year and 2028 base case air quality model simulations. As noted in EPA's TSD, the 2011 base year emissions and methods for projecting these emissions to 2028 are in large part similar to the data and methods used by EPA in the final Cross-State Air Pollution Rule (CSAPR) Update[20] and the subsequent notice of data availability (NODA)[21] to support ozone transport for the 2015 ozone NAAQS. Appendices B-1a and B-2a contain complete reports from ERG detailing the emission inventory work.

There are six different emission inventory source classifications: stationary point sources, nonpoint (formerly called "stationary area") sources, non-road and onroad mobile sources, biogenic sources, and point fires.[22] Stationary point sources are those sources that emit greater

[17] CO is not a visibility impairing pollutant and thus, CO data was not evaluated for this regional haze plan

[18] EPA OAQPS, *Documentation for the EPA's Preliminary 2028 Regional Haze Modeling*, October 2017.

[19] URL: https://www.epa.gov/air-emissions-modeling/2011-version-63-technical-support-document

[20] URL: https://www.epa.gov/airmarkets/final-cross-state-air-pollution-rule-update

[21] URL: https://www.epa.gov/airmarkets/notice-data-availability-preliminary-interstate-ozone-transport-modeling-data-2015-ozone

[22] Note that prescribed fires and wildfires are designated events in the National Emissions Inventory.

than a specified tonnage per year, with data provided at the facility level. Electric generating utilities (EGUs) and industrial sources are the major categories for stationary point sources. Nonpoint sources are those sources whose individual emissions are relatively small, but due to the large number of these sources, the collective emissions from the source category could be significant (e.g., dry cleaners, service stations, combustion of fuels for heating, and agricultural sources). These types of emissions are estimated on a countywide level. Non-road mobile sources are equipment that can move but do not use the roadways (e.g., lawn mowers, construction equipment, and railroad locomotives). The emissions from these sources, like nonpoint sources, are estimated on a countywide level. Onroad mobile sources include passenger cars, motorcycles, minivans, sport-utility vehicles, light-duty trucks, heavy-duty trucks, and buses that are normally operated on public roadways. The emissions from these sources are estimated by vehicle type and road type and are summed to the countywide level. Biogenic sources are the natural sources of emissions like trees, crops, grasses, and natural decay of plants. The emissions from these sources are estimated on a countywide level. The point fire sector includes both prescribed fires and wildfires.

4.1.1. Stationary Point Sources

Point source emissions are emissions from individual sources having a fixed location. Generally, these sources must have permits to operate, and their emissions are inventoried on a regular schedule. Sources emitting at least 5 tons per year of a criteria pollutant or 500 pounds per year of lead are inventoried annually. HAPs are reported every three years at lower levels than most criteria pollutants. The point source emissions data can be grouped as EGU sources and other industrial point sources, also called non-EGUs. Airport-related sources; including aircraft, airport ground support equipment, and jet refueling; are also part of the point source sector. In previous modeling platforms, airport-related sources were included in the non-road sector.

4.1.1.1. Electricity Generating Units

The EGU sector contains emissions from EGUs in the 2011 NEI v2 point inventory that could be matched to units found in the National Electric Energy Database System (NEEDS) v5.15. In most cases, the base year 2011 inventory for the EGU sources used 2011 continuous emissions monitoring system (CEMS) data reported to the EPA's CAMD. These data provide hourly emissions profiles for SO_2 and NO_X that can be used in air quality modeling. Emissions profiles are used to estimate emissions of other pollutants (VOCs, CO, NH_3, $PM_{2.5}$) based on measured emissions of SO_2 and NO_X. The NEEDS database of units includes many smaller emitting EGUs that are not included in the CAMD hourly CEMS programs. Thus, there are more units in the NEEDS database than have CEMS data. Emissions from EGUs vary daily and seasonally as a function of variability in energy demand, utilization, and outage schedules. The temporalization of EGU units matched to CEMS is based on the base year CEMS data for those units, whereas regional profiles are used for the remaining units.

For projected year 2028 EGU point sources, the VISTAS states considered the EPA 2028el, the EPA 2023en, or 2028 emissions from the Eastern Regional Technical Advisory Committee (ERTAC) EGU projection tool from the most recent CONUS 2.7 run. The EPA 2028el emissions inventory for EGUs were created by the Integrated Planning Model (IPM) version 5.16. This scenario represents the implementation of the Cross-State Air Pollution Rule (CSAPR) Update, CSAPR, Mercury and Air Toxics Standards (MATS), Clean Power Plan (CPP) and the final actions the EPA has taken to implement the Regional Haze Rule, the Cooling Water Intakes Rule, and Combustion Residuals from Electric Utilities (CCR). The CPP was later vacated. Impacts of the CPP assumed that coal-fired EGUs would be shut down and replaced by natural gas-fired EGUs.

The ERTAC EGU emissions did not consider the impacts of the CPP. After evaluating the different projection options, each VISTAS state determined the estimated emissions for each EGU for the projected year 2028. Appendix B contains a summary of the action items provided by each VISTAS state in preparing the 2028 EGU emissions inventory. For non-VISTAS states, the EPA 2028el EGU emissions were replaced with the 2028 ERTAC 2.7 EGU emissions. Florida used a combination of ERTAC, 2011el, 2023en, and 2028el for projected 2028 EGU emissions.

4.1.1.2. Other Industrial Point Sources and Airport-Related Sources

The non-EGU sector uses annual emissions contained in the 2011 NEIv2. These emissions are temporally allocated to month, day, and hour using source category code (SCC)-based allocation factors. The Control Strategy Tool (CoST) was used to apply most non-EGU projection/growth factors, controls, and facility/unit/stack-level closures to the 2011 NEI-based emissions modeling inventories to create future year inventory for 2028. Similar to the EGU sector, each state was able to make adjustments to the 2028 non-EGU inventory based on their knowledge of each facility. Airport-related source emissions for the base year 2011 were developed from the 2011 NEIv2. Aircraft emissions for 2011 are projected to future year 2028 by applying activity growth using data on itinerant operations at airports. The itinerate operations are defined as aircraft take-offs or aircraft landings. The EPA used projected itinerate information available from the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) System.

4.1.2. Nonpoint Sources

Nonpoint sources are those sources whose individual emissions are relatively small, but due to the large number of these sources, the collective emissions from the source category could be significant (e.g., dry cleaners, service stations, combustion of fuels for heating, and agricultural sources). Emissions are estimated by multiplying an emission factor by some known indicator of collective activity, such as fuel usage, number of households, or population. Nonpoint source emissions are estimated at the countywide level. The base year 2011 nonpoint source inventory was developed from the 2011NEIv2. The CoST was used to apply most nonpoint projection/growth factors, controls and facility/unit/stack-level closures to the 2011 NEI-based emissions modeling inventories to create future year inventory for 2028.

4.1.3. Non-Road Mobile Sources

Non-road mobile sources are equipment that can move but do not use the roadways, such as construction equipment, railroad locomotives, commercial marine vessels, and lawn equipment. For the majority of the non-road mobile sources, the emissions for 2011 were estimated using the EPA's National Mobile Inventory Model (NMIM, 2005). For the two source categories not included in the NMIM, i.e., railroad locomotives and commercial marine, more traditional methods of estimating the emissions were used.

For the source categories estimated using the EPA's NMIM model, the model growth assumptions were used to create the 2028 future year inventory. The NMIM model takes into consideration regulations affecting emissions from these source categories. The 2028 future-year commercial marine vessels and railroad locomotives emissions account for increased fuel consumption based on Energy Information Administration (EIA) fuel consumption projections for freight, and emissions reductions resulting from emissions standards from the Final Locomotive-Marine rule.

4.1.4. Onroad Mobile Sources

Onroad mobile sources include passenger cars, motorcycles, minivans, sport-utility vehicles, light-duty trucks, heavy-duty trucks, and buses that are normally operated on public roadways. For onroad vehicles, the Motor Vehicle Emissions Simulator (MOVES) model (MOVES2014a) was used to develop base year 2011 emissions. Key inputs for MOVES include information on the age of vehicles on the roads, vehicle miles traveled, the average speeds on the roads, the mix of vehicles on the roads, any programs in place in an area to reduce emissions for motor vehicles (e.g., emissions inspection programs), and temperature. The MOVES model takes into consideration regulations that affect emissions from this source sector. The MOVES model then was run for 2028 inventory using input data reflective of that year.

4.1.5. Biogenic Sources

Biogenic emissions for 2011 were developed using the Biogenic Emission Inventory System version 3.61 (BEIS3.61) within the Sparse Matrix Operator Kernel Emissions (SMOKE). BEIS3.61 creates gridded, hourly, model-species emissions from vegetation and soil. BEIS3.61 includes the incorporation of Version 4.1 of the Biogenic Emissions Land use Database (BELD4) and the incorporation of a canopy model to estimate leaf-level temperatures. BELD version 4.1 is based on an updated version of the USDA-United States Forest Service (USFS)

Forest Inventory and Analysis (FIA) vegetation speciation-based data from 2001 to 2014 in the FIA version 5.1. Canopy coverage is based on the Landsat satellite National Land Cover Database (NLCD) product from 2011. The 2011 biogenic emissions are used for the 2028 future year without any changes.

4.1.6. Point Fires

The point fires sector includes emissions from both prescribed fires and wildfires. The point fire sector excludes agricultural burning and other open burning sources that are included in the nonpoint sector. Fire emissions are specified at geographic coordinates (point locations) and have daily emissions values. Emissions are day-specific and include satellite-derived latitude/longitude of the fire's origin and other parameters associated with the emissions such as acres burned and fuel load, which allow estimation of plume rise.

Fire emissions for the base year 2011 were taken from the 2011NEIv2. The point source day-specific emission estimates for 2011 fires rely on SMARTFIRE 2, which uses the National Oceanic and Atmospheric Administration's (NOAA's) Hazard Mapping System (HMS) fire location information as input. Additional inputs include the CONSUMEv3.0 software application and the Fuel Characteristic Classification System (FCCS) fuel-loading database to estimate fire emissions from wildfires and prescribed burns on a daily basis. SMARTFIRE 2 estimates were used directly for all states except Georgia and Florida. For Georgia, the satellite-derived emissions were removed from the fire inventory and replaced with a separate state-supplied fire inventory. Adjustments were also made to Florida to rescale their emissions to match the total acres burned that Florida reported in the NEI. The 2011 fire emissions are used for the 2028 future year without any changes.

4.1.7. Summary 2011 Baseline Emissions Inventory for Florida

Table 4-1 is a summary of the 2011 baseline emission inventory for Florida. The complete inventory and discussion of the methodology is contained in Appendix B. The emissions summaries for other VISTAS states can also be found in Appendix B.

Table 4-1: 2011 Emissions Inventory Summary for Florida (tpy)

Sector	CO	NH_3	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
EGU	43,819	3,394	68,655	13,069	10,882	95,423	3,332
Non-EGU Point	85,603	2,462	40,973	13,768	11,406	37,440	26,268
Nonpoint	121,431	38,676	70,123	338,905	80,117	27,743	262,124
Onroad	1,784,678	7,465	308,752	21,329	9,377	2,104	183,609
Non-Road	1,078,298	142	98,584	10,126	9,627	275	162,907
Point-Fires	960,190	15,918	21,279	104,982	88,968	9,716	228,822
Total	**4,074,019**	**68,057**	**608,366**	**502,179**	**210,377**	**172,701**	**867,062**

4.1.8. Emissions Inventory Improvements Prior to Remodeling 2028 Future Year

The VISTAS initial emission inventory was completed in June 2018. The VISTAS initial modeling for the future year 2028 was completed in October 2019. VISTAS compared the VISTAS' emission inventory information to EPA's modeling inventory, which was released in September 2019. EPA used a base year of 2016 and a future year of 2028. One main difference between the VISTAS and EPA modeling is that VISTAS used a base year of 2011 and EPA used a base year of 2016. This is an important difference since the future year 2028 emissions are generally projected from the base year. VISTAS noted large differences in SO_2 and NO_X emissions, with EPA's emissions being much lower. One reason for this difference was that VISTAS initial modeling used an older version of ERTAC, which did not account for many coal-fired EGU retirements and fuel switches. Table 4-2 below compares the 2028 point emissions used by VISTAS versus the latest 2028fh[23] emissions used by EPA (projected from 2016). The emissions in Table 4-2 are extracted from the VISTAS12 modeling domain, which covers the eastern US. As shown in Table 4-2, EPA's SO_2 emissions are 46% lower than VISTAS' estimates, and EPA's NO_X emissions are 20% lower than VISTAS' estimates.

Table 4-2: VISTAS 2028 versus New EPA 2028

Pollutant	VISTAS 2028 (tpy)	New EPA 2028 (tpy)	Difference (tpy)	Difference (%)
NO_X	2,641,463.83	2,108,115.50	533,348.33	20.19%
SO_2	2,574,542.02	1,400,287.10	1,174,254.92	45.61%

The two tables below compare the SO_2 and NO_X emissions for the older version of ERTAC (2.7opt) and the newer version of ERTAC (16.0), with the newer version of ERTAC having much lower emissions. The older version of ERTAC was used in the VISTAS modeling in the non-VISTAS states. As explained in Section 4.1.1 above, each VISTAS state determined the estimated emissions for each EGU in their state for the projected year 2028.

Table 4-3: SO_2 Old ERTAC (2.7opt) versus SO_2 New ERTAC (16.0)

RPO	16.0 2028 (tpy)	2.7opt 2028 (tpy)	Difference (tpy)	Difference (%)
CENSARA	367,683.7	760,828.2	-393,144.5	-51.67%
LADCO	266,047.0	379,577.5	-113,530.5	-29.91%
MANE-VU	78,657.0	196,672.6	-118,015.6	-60.01%
VISTAS	161,502.5	273,582.1	-112,079.6	-40.97%
Total	**976,471.2**	**1,783,376.5**	**-806,905.3**	**-45.25%**

[23] The "f" represents the base year emissions modeling platform iteration, which here shows that it is 2014 NEI-based (whereas for 2011 NEI-based platforms, this letter was "e"); and the "h" stands for the eighth configuration of emissions modeled for a 2014-NEI based modeling platform).

Table 4-4: NO_X Old ERTAC (2.7opt) versus NO_X New ERTAC (16.0)

RPO	16.0 2028 (tpy)	2.7opt 2028 (tpy)	Difference (tpy)	Difference (%)
CENSARA	244,499.3	354,795.1	-110,295.8	-31.09%
LADCO	166,429.4	198,966.9	-32,537.4	-16.35%
MANE-VU	56,315.3	83,432.5	-27,117.2	-32.50%
VISTAS	200,791.1	270,615.7	-69,824.6	-25.80%
Total	840,973.6	1,166,663.1	-325,689.5	-27.92%

The Regional Haze Rule and guidance indicate that future year projections should be as accurate as possible. Thus, after consulting with EPA, VISTAS decided to model the future year 2028 again in order to have more accurate visibility projections. VISTAS made several improvements to the 2028 emissions inventory before remodeling the 2028 future year. These inventory improvements are detailed in the VISTAS emissions inventory report in Appendix B-2a. Each VISTAS state was given the opportunity to adjust any point source emissions in the 2028 inventory. For EGUs in the non-VISTAS states, ERTAC 2.7 emissions were replaced with the ERTAC 16.0 emissions, except for the LADCO states where ERTAC 2.7 emissions were replaced with ERTAC 16.1 emissions.

4.2. Summary of the 2028 Emissions Inventory and Assessment of Relative Contributions from Specific Pollutants and Source Categories

As noted in Section 2.4 for the years 2000-2004 and Section 2.6 for years 2014-2018, ammonium sulfate is the largest contributor to visibility impairment at the Florida Class I areas, and reduction of SO_2 emissions would be the most effective means of reducing ammonium sulfate. As illustrated in Figure 4-1, 91.2% of 2011 SO_2 emissions in the VISTAS states are attributable to electric generating facilities and industrial point sources. Similarly, in Florida the stationary point sources, consisting mostly of electric generating facilities and industrial point sources, contribute 76.9% of SO_2 emissions in the state (see Table 4-5).

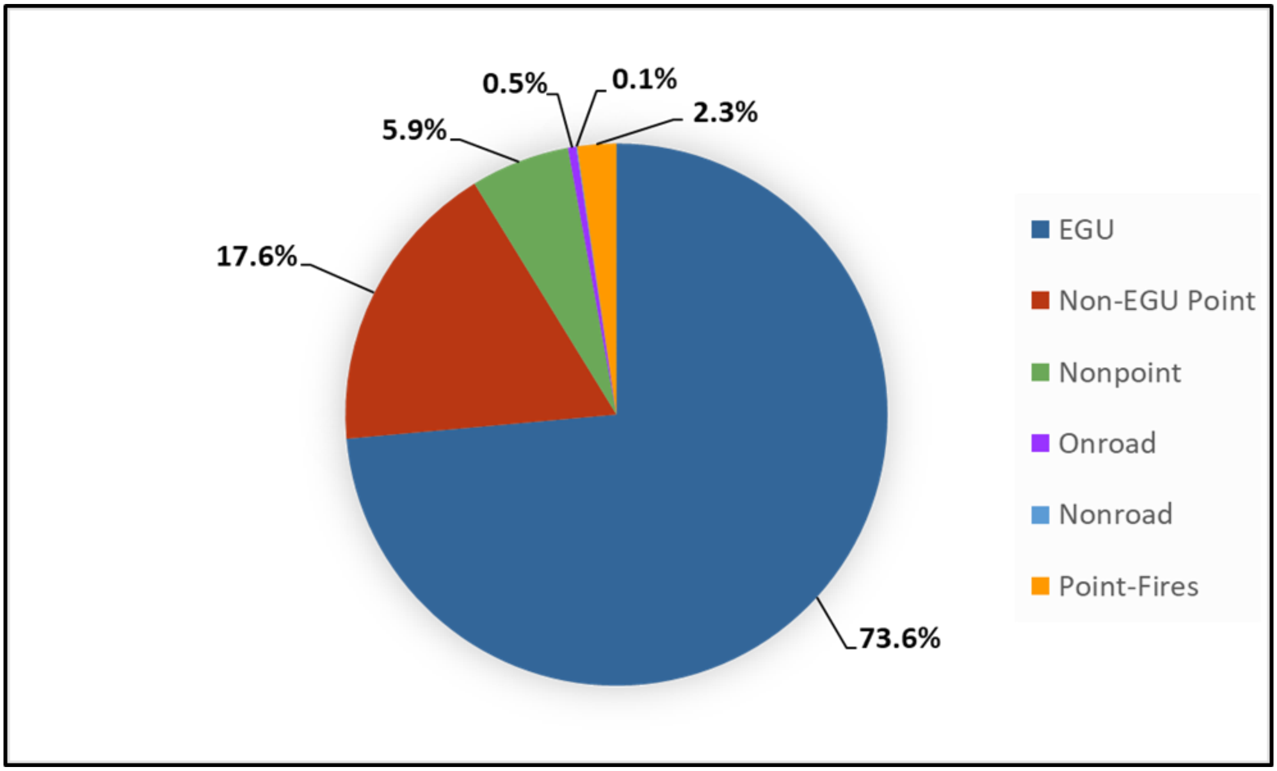

Figure 4-1: 2011 SO_2 Emissions in the VISTAS States

Table 4-5: 2011 SO_2 Emissions for Florida, tpy

Sector	SO_2, tpy	Percentage
Point	132,863	76.9%
Nonpoint	27,743	16.1%
Onroad	2,104	1.2%
Non-Road	275	0.2%
Point-Fires	9,716	5.6%
Total	172,701	100.0%

Since the largest source of SO_2 emissions comes from the stationary point sources, the focus of potential controls and the impacts for those controls was on this source sector. In Florida, the types of sources emitting SO_2, and thus contributing to the visibility impairment of the Class I areas, were predominately coal fired utilities and industrial boilers.

5. Regional Haze Modeling Methods and Inputs

Modeling for regional haze was performed by VISTAS for the ten southeastern states, including Florida. The following sections outline the methods and inputs used by VISTAS for the regional modeling. Additional details are provided in Appendix E.

5.1. Analysis Method

The modeling analysis is a complex technical evaluation that begins by selection of the modeling system. For the most part, the modeling analysis approach for regional haze followed EPA's 2011el-based air quality modeling platform, which includes emissions, meteorology, and other inputs for 2011 as the base year for the modeling described in their regional haze TSD (EPA, 2017). EPA projected the 2011 base year emissions to a 2028 future year base case scenario. EPA's work is the foundation of the emissions used in the VISTAS analysis, with significant revisions as described in Appendix B. As noted in EPA's documentation, the 2011 base year emissions and methods for projecting these emissions to 2028 are in large part similar to the data and methods used by EPA in the final CSAPR Update[24] and the subsequent NODA[25] to support ozone transport mandates for the 2015 ozone NAAQS. VISTAS decided to use the following modeling systems:

- Meteorological Model: The Weather Research and Forecasting (WRF) model is a mesoscale numerical weather prediction system designed to serve both operational forecasting and atmospheric research needs (Skamarock, 2004; 2006; Skamarock et al., 2005). The Advanced Research WRF (ARW) version of WRF was used in this regional haze analysis study. It features multiple dynamical cores, a three-dimensional variational (3DVAR) data assimilation system, and a software architecture allowing for computational parallelism and system extensibility. WRF is suitable for a broad spectrum of applications across scales ranging from meters to thousands of kilometers.

- Emissions Model: Emissions processing was completed using the SMOKE model for most source categories. The exceptions include EGUs for certain areas, as well as the biogenic and mobile sectors. For certain areas in the modeling domain, the ERTAC EGU Forecasting Tool[26] was used to grow base year hourly EGU emissions inventories into future projection years. The tool uses base year hourly EPA CAMD data, fuel specific growth rates, and other information to estimate future emissions. The BEIS model was used for biogenic emissions. Special processors were used for fires, windblown dust, lightning, and sea salt emissions. The 2014 MOVES onroad mobile source emissions

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[24] URL: https://www.epa.gov/airmarkets/final-cross-state-air-pollution-rule-update
[25] URL: https://www.epa.gov/airmarkets/notice-data-availability-preliminary-interstate-ozone-transport-modeling-data-2015-ozone
[26] URL: https://marama.org/technical-center/ertac-egu-projection-tool/

model was used by EPA with SMOKE-MOVES to generate onroad mobile source emissions with EPA generated vehicle activity data provided in the 2028 regional haze analysis.

- Air Quality Model: The Comprehensive Air Quality Model with Extensions (CAMx) Version 6.40 was used in this study, with the secondary organic aerosol partitioning (SOAP) algorithm module as the default. The CAMx photochemical grid model, which supports two-way grid nesting was used. The setup is based on the same WRF/SMOKE/CAMx modeling system used in the EPA 2011/2028el platform modeling. The Particulate Source Apportionment Technology (PSAT) tool of CAMx was selected to develop source contribution and significant contribution calculations.

Episode selection is an important component of any modeling analysis. EPA guidance recommends choosing time periods that reflect the variety of meteorological conditions representing visibility impairment on the 20% clearest and 20% most impaired days in the Class I areas being modeled. This is best accomplished by modeling a full year. For this analysis, VISTAS performed modeling for the full 2011 calendar year with 10 days of model spin-up in 2010.

Once base year model performance was deemed adequate, the future year emissions were processed. The air quality modeling results were used to determine a relative reduction in future visibility impairment, which was used to determine future visibility conditions and reasonable progress goals.

The complete modeling protocol used for this analysis can be found in Appendix E-1b.

5.2. Model Selection

To ensure that a modeling study is defensible, care must be taken in the selection of the models to be used. The models selected must be scientifically appropriate for the intended application and be freely accessible to all stakeholders. "Scientifically appropriate" means that the models address important physical and chemical phenomena in sufficient detail, using peer-reviewed methods. "Freely accessible" means that model formulations and coding are freely available for review and that the models are available to stakeholders, and their consultants, for execution and verification at no or low cost.

The following sections outline the criteria for selecting a modeling system that is both defensible and capable of meeting the study's goals. These criteria were used in selecting the modeling system for this modeling demonstration.

5.2.1. Selection of Photochemical Grid Model

5.2.1.1. Criteria

For a photochemical grid model to qualify as a candidate for use in a regional haze SIP, a state needs to show that it meets the same general criteria as a model for a NAAQS attainment demonstration. EPA's current modeling guidelines lists the following criteria for model selection (EPA, 2018):

- It should not be proprietary;
- It should have received a scientific peer review;
- It should be appropriate for the specific application on a theoretical basis;
- It should be used with databases that are available and adequate to support its application;
- It should be shown to have performed well in past modeling applications;
- It should be applied consistently with an established protocol on methods and procedures;
- It should have a User's Guide and technical description;
- The availability of advanced features (e.g. probing tools or science algorithms) is desirable; and
- When other criteria are satisfied, resource considerations may be important and are a legitimate concern.

5.2.1.2. Overview of CAMx

The CAMx model[27] is a state-of-science "One-Atmosphere" photochemical grid model capable of addressing ozone, PM, visibility, and acid deposition at a regional scale for periods up to one year (Ramboll Environ, 2016). CAMx is a publicly-available open-source computer modeling system for the integrated assessment of gaseous and particulate air pollution and meets all the photochemical grid model criteria above. Built on today's understanding that air quality issues are complex, interrelated, and reach beyond the urban scale, CAMx is designed to: (a) simulate air quality over many geographic scales; (b) treat a wide variety of inert and chemically active pollutants including ozone, inorganic and organic $PM_{2.5}$ and PM_{10}, mercury, and toxics; (c) provide source-receptor, sensitivity, and process analyses; and (d) be computationally efficient and easy to use. EPA has approved the use of CAMx for numerous ozone, PM, and regional haze

[27] URL: http://www.camx.com

SIPs throughout the U.S. and has used this model to evaluate regional mitigation strategies including those for most recent regional-scale rules such as CSAPR.

5.2.2. Selection of Meteorological Model

5.2.2.1. Criteria

Meteorological models, either through objective, diagnostic, or prognostic analysis, extend available information about the state of the atmosphere to the grid upon which photochemical grid modeling is to be carried out. The criteria for selecting a meteorological model are based on both the model's ability to accurately replicate important meteorological phenomena in the region of study and the model's ability to interface with the rest of the modeling systems – particularly the photochemical grid model. With these issues in mind, the following criteria were established for the meteorological model to be used in this study:

- Non-hydrostatic formulation;
- Reasonably current, peer reviewed formulation;
- Simulates cloud physics;
- Publicly available at no or low cost;
- Output available in Input/Output Applications Programming Interface (I/O API) format;
- Supports four-dimensional data assimilation (FDDA); and
- Enhanced treatment of planetary boundary layer heights for air quality modeling.

5.2.2.2. Overview of WRF

The WRF[28] model is a mesoscale numerical weather prediction system designed to serve both operational forecasting and atmospheric research needs (Skamarock, 2004; 2006; Skamarock et al., 2005). The ARW version of WRF was used in this regional haze analysis study and meets all the meteorological model criteria above. It features multiple dynamical cores, a three-dimensional variational data assimilation system, and a software architecture allowing for computational parallelism and system extensibility. WRF is suitable for a broad spectrum of applications across scales ranging from meters to thousands of kilometers. The effort to develop WRF has been a collaborative partnership, principally among the National Center for Atmospheric Research (NCAR), NOAA, the National Centers for Environmental Prediction (NCEP) and the Forecast Systems Laboratory (FSL), the Air Force Weather Agency (AFWA), the Naval Research Laboratory, the University of Oklahoma, and the FAA. WRF allows researchers the ability to conduct simulations reflecting either real data or idealized configurations. WRF is a model that provides operational weather forecasting. It is flexible and

[28] URL: http://www.wrf-model.org/index.php

computationally efficient while offering the advances in physics, numerics, and data assimilation contributed by the research community.

The configuration used for this modeling demonstration, as well as a more detailed description of the WRF model, can be found in the EPA's meteorological modeling report (EPA, 2014d).

5.2.3. Selection of Emissions Processing System

5.2.3.1. Criteria

The principal criterion for an emissions processing system is that it accurately prepares emissions files in a format suitable for the photochemical grid model being used. The following list includes clarification of this criterion and additional desirable criteria for effective use of the system.

- File system compatibility with the I/O API;
- File portability;
- Ability to grid emissions on a Lambert conformal projection;
- Report capability;
- Graphical analysis capability;
- MOVES mobile source emissions;
- BEIS version 3;
- Ability to process emissions for the proposed domain in a reasonable amount of time;
- Ability to process control strategies;
- No or low cost for acquisition and maintenance; and
- Expandable to support other species and mechanisms.

5.2.3.2. Overview of SMOKE

The SMOKE[29] modeling system is an emissions modeling system that generates hourly gridded speciated emission inputs of mobile, non-road, nonpoint area, point, fire and biogenic emission sources for photochemical grid models (Coats, 1995; Houyoux et al., 1999) and meets all the emissions processing system criteria above. As with most "emissions models," SMOKE is principally an emissions processing system; its purpose is to provide an efficient modern tool for converting existing base emissions inventory data into the hourly gridded speciated formatted emission files required by a photochemical grid model. For biogenic, mobile, and EGU sources,

[29] URL: http://www.smoke-model.org/index.cfm

external emission models/processors were used to prepare SMOKE inputs. MOVES2014 is EPA's latest onroad mobile source emissions model and was first released in July 2014 (EPA, 2014a; 2014b; 2014c). MOVES2014 includes the latest onroad mobile source emissions factor information. Emission factors developed by EPA were used in this analysis. SMOKE-MOVES uses an emissions factor look-up table from MOVES, county-level gridded vehicle miles travelled (VMT) and other activity data, and hourly gridded meteorological data (typically from WRF) to generate hourly gridded speciated onroad mobile source emissions inputs. The ERTAC EGU Forecasting Tool[30] was developed through a collaborative effort to improve emission inventories among the Northeastern, Mid-Atlantic, Southeastern, and Lake Michigan area states; other member states; industry representatives; and multi-jurisdictional organization (MJO) representatives. The tool was used for some states to grow base year hourly EGU emissions inventories into future projection years. The tool uses base year hourly EPA CAMD data, fuel specific growth rates, and other information to estimate future emissions. Biogenic emissions were modeled by EPA using version 3.61 of BEIS. First developed in 1988, BEIS estimates VOC emissions from vegetation and nitric oxide (NO) emissions from soils. Because of resource limitations, recent BEIS development has been restricted to versions that are built within the SMOKE system. Additional information about the SMOKE model is contained in Appendix E.

5.3. Selection of the Modeling Year

A crucial step to SIP modeling is the selection of the period of time to model so that air quality conditions may be well represented and so that changes in air quality in response to changes in emissions may be projected.

EPA's most recent regional haze modeling guidance (EPA, 2018) contains recommended procedures for selecting modeling episodes. The VISTAS regional haze modeling used the annual calendar year 2011 modeling period. Calendar year 2011 satisfies the criteria in EPA's modeling guidance episode selection discussion and is consistent with the base year modeling platform. Specifically, EPA's guidance recommends choosing a time period which reflects the variety of meteorological conditions that represent visibility impairment on the 20% clearest and 20% most-impaired days in the Class I areas being modeled (high and low concentrations necessary). This is best accomplished by modeling a full calendar year.

In addition, the 2011/2028 modeling platform was the most recent available platform when VISTAS started their modeling work. EPA's 2016-based platform became available at a later date after VISTAS had already invested a considerable amount of time and money into the modeling analysis. Using the 2016-based platform was not feasible from a monetary perspective, nor could such work be done in a timely manner.

[30] URL: https://marama.org/technical-center/ertac-egu-projection-tool/

5.4. Modeling Domains

5.4.1. Horizontal Modeling Domain

The VISTAS modeling used a 12-kilometer (km) continental U.S. (CONUS_12 or 12US2) domain. The 12-km nested grid modeling domain (Figure 5-1) represents the CAMx 12-km air quality and SMOKE/BEIS emissions modeling domain. As shown in EPA's meteorological model performance evaluation document, the WRF meteorological modeling was run on a larger 12-km modeling domain than the 12-km domain that was used for CAMx (EPA, 2014d). The WRF meteorological modeling domains are defined larger than the air quality modeling domains because meteorological models can sometimes produce artifacts in the meteorological variables near the boundaries as the prescribed boundary conditions come into dynamic balance with the coupled equations and numerical methods in the meteorological model.

An additional VISTAS_12 domain was prepared that is a subset of the CONUS_12 domain. Development of the VISTAS_12 domain (also presented in Figure 5-1) requires the EPA CONUS_12 simulation to be run using CAMx Version 6.40 modeling saving 3-dimensional concentration fields for extraction using the CAMx BNDEXTR program. Dimensions for both VISTAS_12 and CONUS_12 domains are provided in Table 5-1.

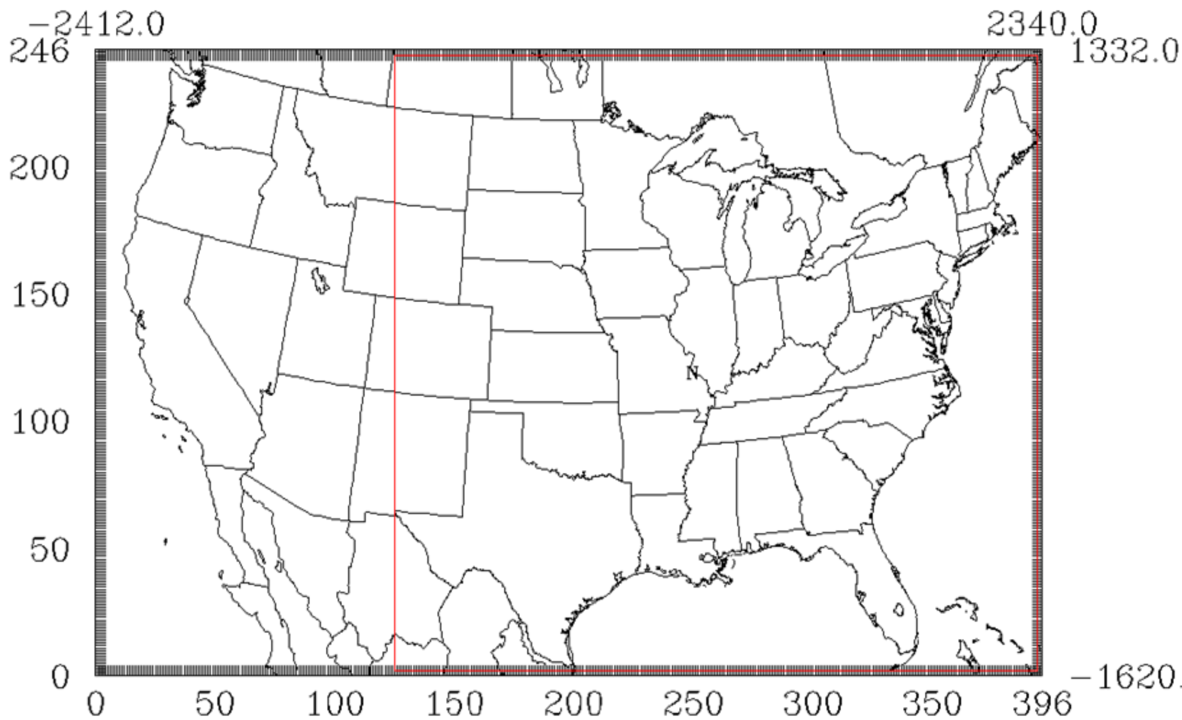


Figure 5-1: Map of 12-km CAMx Modeling Domains; VISTAS_12 Domain Represented as Inner Red Domain

Table 5-1: VISTAS II Modeling Domain Specifications

Domain	Columns	Rows	Vertical Layers	X Origin (km)	Y Origin (km)
CONUS_12	396	246	25	-2,412	-1,620
VISTAS_12	269	242	25	-912	-1,596

5.4.2. Vertical Modeling Domain

The CAMx vertical structure is primarily defined by the vertical layers used in the WRF meteorological modeling. The WRF model employs a terrain following coordinate system defined by pressure, using multiple layer interfaces that extend from the surface to 50 millibar (mb) (approximately 19 km above sea level). EPA ran WRF using 35 vertical layers. A layer averaging scheme is adopted for CAMx simulations whereby multiple WRF layers are combined into one CAMx layer to reduce the air quality model computational time. Table 5-2 displays the approach for collapsing the 35 vertical layers in WRF to 25 vertical layers in CAMx. This approach is consistent with EPA's draft 2028 regional haze modeling.[31]

Table 5-2: WRF and CAMx Layers and Their Approximate Height Above Ground Level

CAMx Layer	WRF Layers	Sigma P	Pressure (mb)	Approximate Height (meters above ground level)
25	35	0.00	50.00	17,556
25	34	0.05	97.50	14,780
24	33	0.10	145.00	12,822
24	32	0.15	192.50	11,282
23	31	0.20	240.00	10,002
23	30	0.25	382.50	7,064
22	29	0.30	335.00	7,932
22	28	0.35	382,50	7,064
21	27	0.40	430.00	6,275
21	26	0.45	477.50	5,553
20	25	0.50	525.00	4,885
20	24	0.55	572.50	4,264
19	23	0.60	620.00	3,683
18	22	0.65	667.50	3,136
17	21	0.70	715.00	2,619
16	20	0.74	753.00	2,226
15	19	0.77	781.50	1,941
14	18	0.80	810.00	1,665
13	17	0.82	829.00	1,485
12	16	0.84	848.00	1,308
11	15	0.86	867.00	1,134
10	14	0.88	886.00	964
9	13	0.90	905.00	797
9	12	0.91	914.50	714
8	11	0.92	924.00	632
8	10	0.93	933.50	551

31 Table 2-2, EPA, 2017.

CAMx Layer	WRF Layers	Sigma P	Pressure (mb)	Approximate Height (meters above ground level)
7	9	0.94	943.00	470
7	8	0.95	952.50	390
6	7	0.96	962.00	311
5	6	0.97	971.50	232
4	5	0.98	981.00	154
4	4	0.99	985.75	115
3	3	0.99	985.75	115
2	2	1.00	995.25	38
1	1	1.00	997.63	19

5.5. EPA Regional Haze Modeling

EPA also completed regional haze modeling and released a Technical Support Document (TSD) summarizing modeling results for each Class I area.[32] The modeling projects 2028 visibility conditions and estimates source sector contributions to visibility impairment at each Class I area, including international anthropogenic contributions. EPA's modeling is available to inform the states' SIP development process.

The EPA used a 2016 modeling platform developed collaboratively with state, local, tribal, regional, and federal air planning agencies. The modeling platform includes emissions, meteorology, and other inputs for the base year 2016, with the base year emissions projected to the future year 2028 base case scenario. The 2016 and projected 2028 emissions were derived from the "beta" version of the collaborative interagency process. The 2016 base year emissions and methods for projecting these emissions to 2028 are further described in the TSD "Preparation of Emissions Inventories for the Version 7.2 2016 North American Emissions Modeling Platform".[33] The meteorological data was derived from the WRF model and the initial and boundary concentrations were derived from hemispheric scale runs of the CMAQ model.[34] The lateral boundary and initial species concentrations are based on a hemispheric modeling platform.[35] EPA's modeling used CAMx version 7.0 beta.

The Department's use of EPA's regional haze modeling results with respect to Everglades is discussed in Section 6.6.

[32] Availability of Modeling Data and Associated Technical Support Document for the EPA's Updated 2028 Visibility Air Quality Modeling. Richard A. Wayland Memorandum, U.S. EPA OAQPS. September 19, 2019. Available at https://www.epa.gov/sites/production/files/2019-10/documents/updated_2028_regional_haze_modeling-tsd-2019_0.pdf

[33] U.S. EPA, 2019a. Preparation of Emissions Inventories for the Version 7.2 2016 North American Emissions Modeling Platform. U.S. Environmental Protection Agency

[34] U.S. EPA, 2019b. Meteorological Model Performance for Annual 2016 Simulation WRF v3.8. (EPA-454/R-19-010) United States Environmental Protection Agency.

[35] U.S. EPA, 2019c. 2016 Hemispheric Modeling Platform Version 1: Implementation, Evaluation, and Attribution. Research Triangle Park, NC. U.S. Environmental Protection Agency. U.S. EPA.

6. Model Performance Evaluation

The VISTAS 2011 modeling platform (VISTAS2011) used meteorological modeling files developed by EPA. The evaluation of the meteorological modeling can be found in the EPA's document titled, "Meteorological Model Performance for Annual 2011 WRF v3.4 Simulation."[36] Overall, the meteorological modeling was deemed acceptable for regulatory applications.

In keeping with the one-atmosphere objective of the CAMx modeling platform, model performance was evaluated for ozone, fine particles, and acid deposition. For the model performance analysis, model predictions were paired in space and time with observational data from various monitoring networks. Modeled 8-hour ozone concentrations were compared to observations from the EPA's Air Quality System (AQS) network. Modeled 24-hour speciated PM concentrations were compared to observations from IMPROVE, CSN, and Clean Air Status and Trends Network (CASTNet) monitoring networks. Modeled weekly speciated wet and dry deposition species were compared to observations from the National Acid Deposition Program (NADP) and CASTNet. Additional information on VISTAS modeling and model performance can be found in Appendix E-3.

6.1. Ozone Model Performance Evaluation

As indicated by the statistics in Table 6-1, bias and error for maximum daily 8-hour average (MDA8) ozone are relatively low in the region. Mean bias (MB) for MDA8 ozone ≥ 60 parts per billion (ppb) during each month (May through September) was within ±5 ppb at AQS sites in the VISTAS states, ranging from -0.13 ppb (September) to 3.79 ppb (July). The mean error (ME) is less than 10 ppb in all months. Normalized mean bias (NMB) is within ±5% for AQS sites in all months except July (5.63%). The mean bias and normalized mean bias statistics indicate a tendency for the model to over predict MDA8 ozone concentrations in the months of May through August and slightly under predict MDA8 ozone concentrations in September for AQS sites. The normalized mean error (NME) is less than 15% in the region across all months.

Table 6-1: Performance Statistics for MDA8 Ozone ≥ 60 ppb by Month for VISTAS States Based on Data at AQS Network Sites

Region	Month	# of Obs	MB (ppb)	ME (ppb)	NMB (%)	NME (%)
VISTAS	May	838	2.48	6.11	3.79	9.34
VISTAS	Jun	2028	1.73	7.11	2.57	10.55
VISTAS	Jul	1233	3.79	8.88	5.63	13.21
VISTAS	Aug	1531	2.38	6.94	3.59	10.48
VISTAS	Sep	681	-0.13	6.09	-0.19	9.08

Figure 6-1 through Figure 6-4 show the spatial variability in bias and error at monitor locations. Mean bias, as seen from Figure 6-1, is within ±5 ppb at most sites across the VISTAS12 domain

[36] URL: https://www.epa.gov/sites/production/files/2020-10/documents/met_tsd_2011_final_11-26-14.pdf

with a maximum under-prediction of 23.44 ppb at one site (AQS monitor 550030010) in Ashland County, Wisconsin and a maximum over-prediction of 17.95 ppb in York County, South Carolina (AQS monitor 450910006); both with small sample sizes (n=1 and n=7, respectively). A positive mean bias is generally seen in the range of 5 to 10 ppb with regions of 10 to 15 ppb over-prediction seen scattered throughout the domain. The model has a tendency to underestimate in the western portion of the domain and overestimate in the eastern portion of the domain.

Figure 6-2 indicates that the normalized mean bias for days with observed MDA8 ozone ≥ 60 ppb is within ± 10% at the vast majority of monitoring sites across the VISTAS12 modeling domain. Monitors in Ashland County, Wisconsin and York County, South Carolina again bookend the NMB range with 38% and 27%, respectively. There are regional differences in model performance, as the model tends to over predict at most sites in the eastern region of the VISTAS12 domain and generally underpredict at sites in and around the western and northwestern borders of the domain.

The ME, as seen from Figure 6-3, is generally 10 ppb or less at most of the sites across the VISTAS12 modeling domain although the Ashland, Wisconsin and York County, South Carolina monitors show much higher ME of 23.44 and 17.95 ppb, respectively. VISTAS states show less than 10% of their monitors above 10 ppb model error, with the majority of those within this value. Figure 6-4 indicates that the NME for days with observed MDA8 ozone ≥ 60 ppb is less than 15% at the vast majority of monitoring sites across the VISTAS12 modeling domain. Noted exceptions seen are monitors 450910006 (York County, South Carolina), 470370011 (Davidson County, Tennessee), and 120713002 (Lee County, Florida) with NMEs of 27%, 25%, and 23%, respectively. Somewhat elevated NMEs (> 15%) are seen in and around many of the VISTAS state metro areas.

Additional details on the ozone model performance evaluation can be found in Appendix E-5.

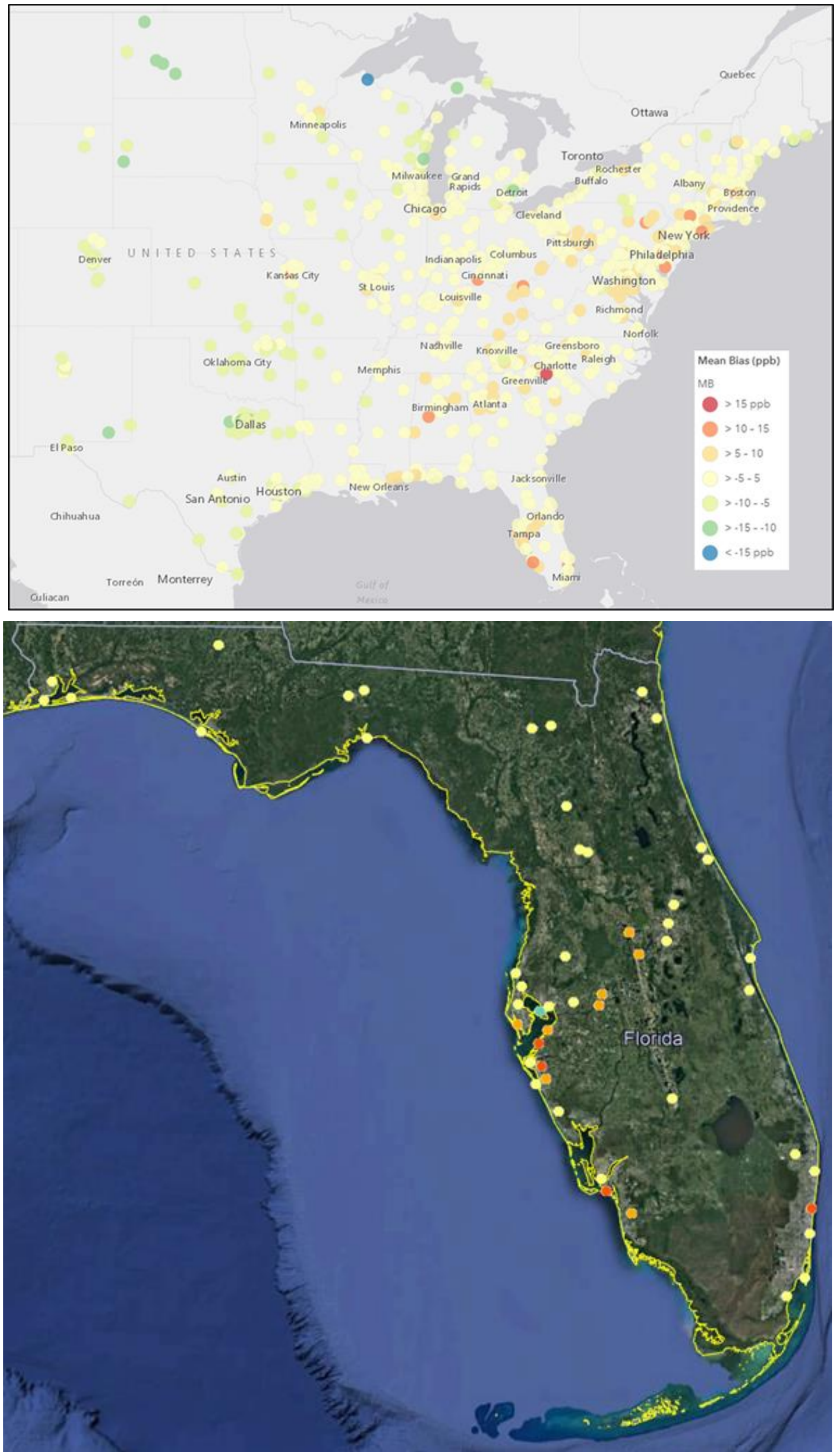


Figure 6-1: Mean Bias (ppb) of MDA8 Ozone ≥ 60 ppb Over the Period May-September 2011 at AQS Monitoring Sites in VISTAS12 Domain (top) and in Florida (bottom)

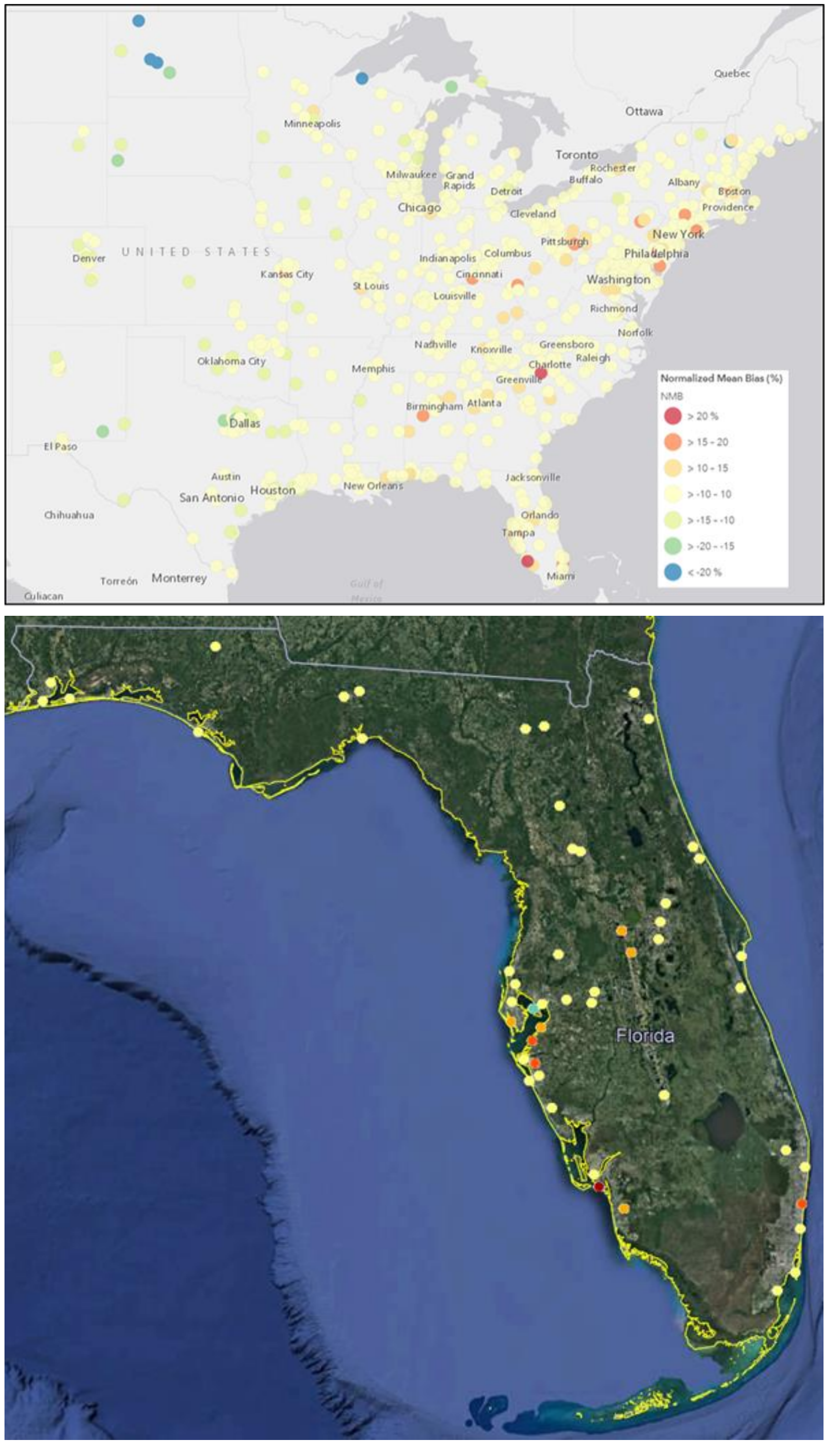


Figure 6-2: Normalized Mean Bias (%) of MDA8 Ozone ≥ 60 ppb Over the Period May-September 2011 at AQS Monitoring Sites in VISTAS12 Domain (top) and in Florida (bottom)

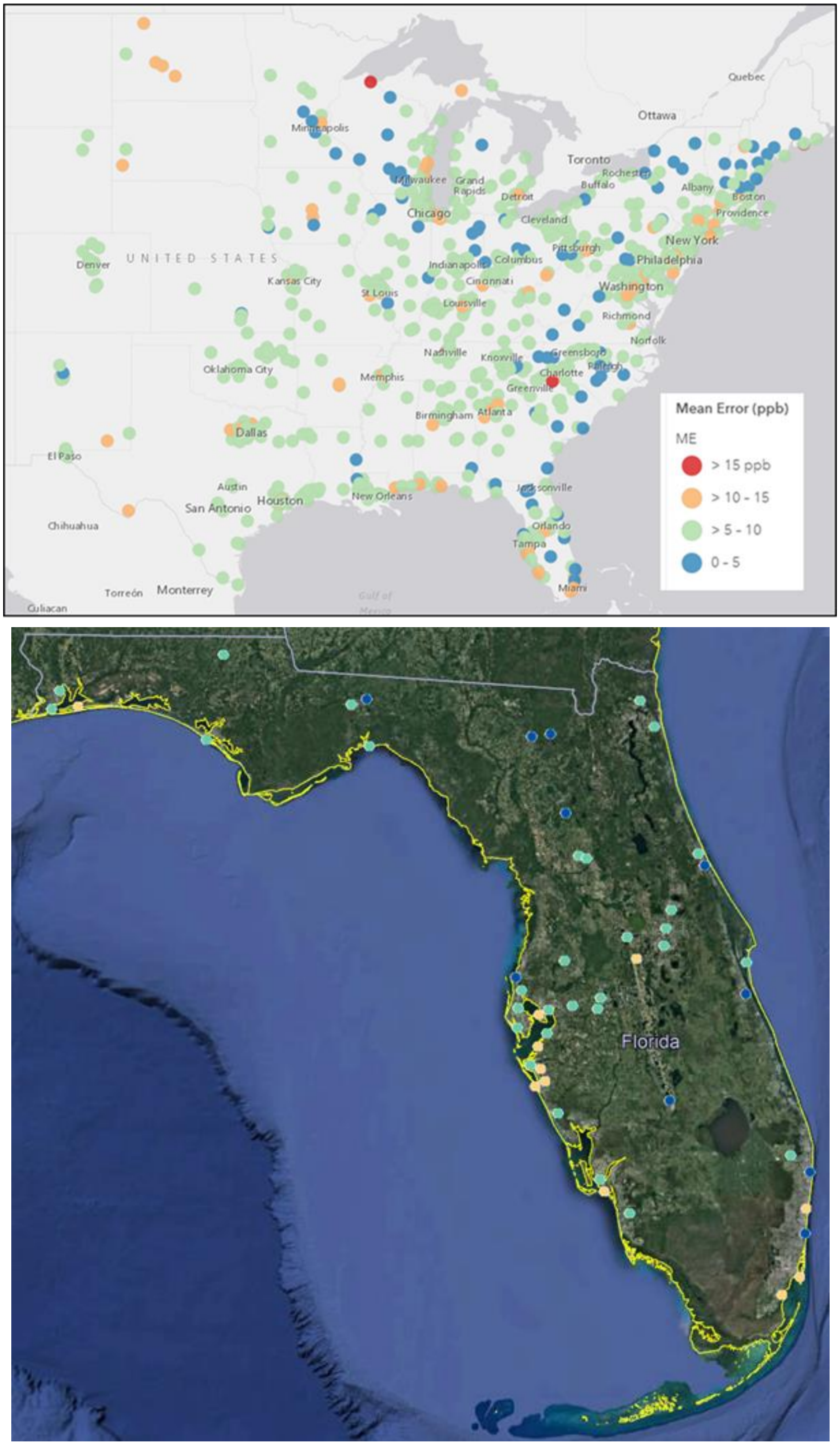


Figure 6-3: ME (ppb) of MDA8 Ozone ≥ 60 ppb Over the Period May-September 2011 at AQS Monitoring Sites in VISTAS12 Domain (top) and in Florida (bottom)

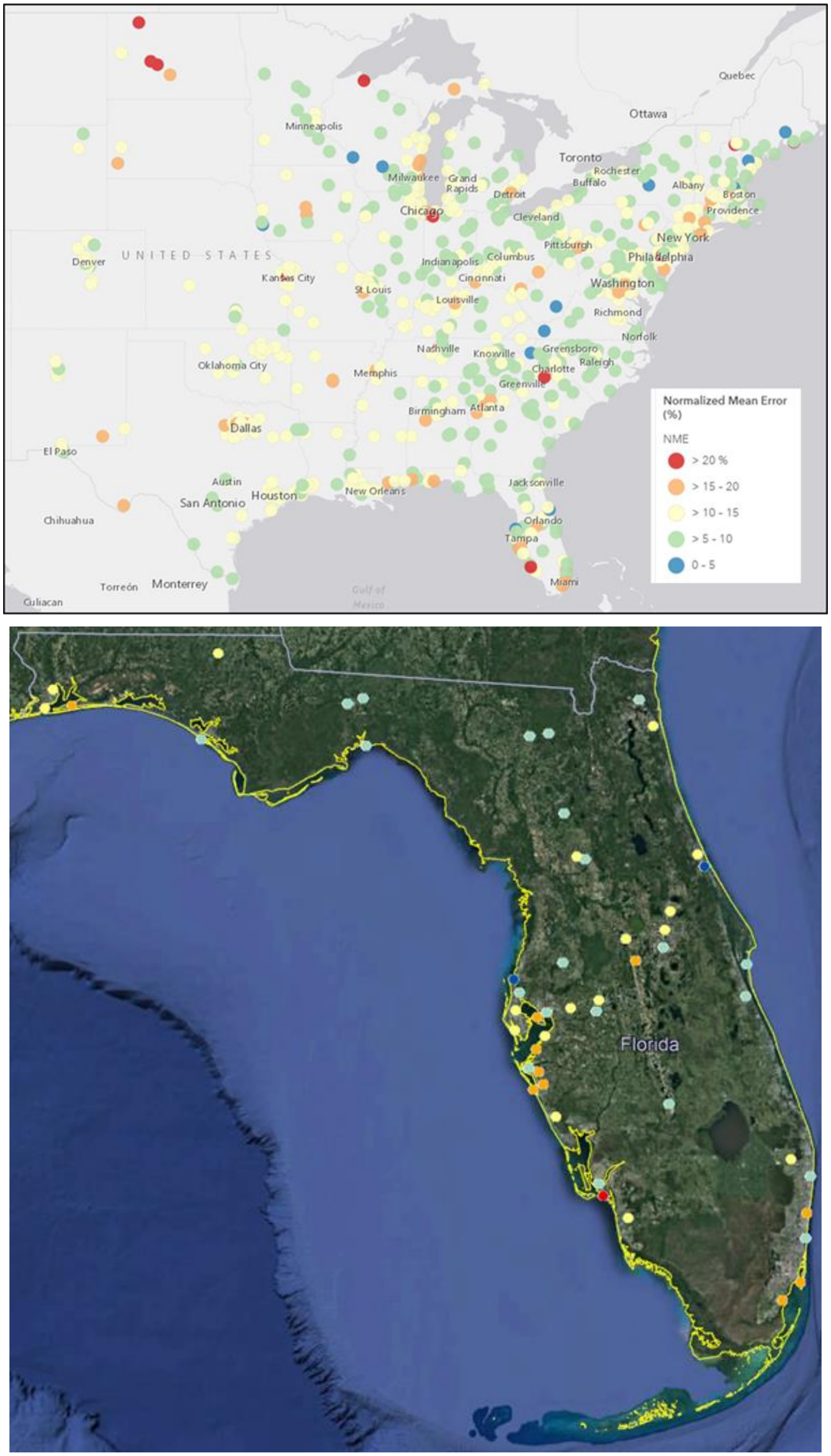


Figure 6-4: NME (%) of MDA8 Ozone > 60 ppb Over the Period May-September 2011 at AQS Monitoring Sites in VISTAS12 Domain (top) and in Florida (bottom)

6.2. Acid Deposition Model Performance Evaluation

The primary source for deposition data is the National Atmospheric Deposition Program (NADP).[37] The NADP monitoring networks used in this evaluation include:

- National Trends Network (NTN)
- Atmospheric Integrated Research Monitoring Network (AIRMon)
- Ammonia Monitoring Network (AMoN)

Dry deposition information is also available from CASTNet. The data from NTN and AIRMon were used in the wet deposition MPE, and the data from CASTNET and AMoN were used for dry deposition MPE. The MPE focused on the monitors from these networks within the VISTAS 12-km modeling domain (Figure 6-5).

[37] National Atmospheric Deposition Program (NRSP-3). 2018. NADP Program Office, Wisconsin State Laboratory of Hygiene, 465 Henry Mall, Madison, WI 53706. URL: http://nadp.slh.wisc.edu/

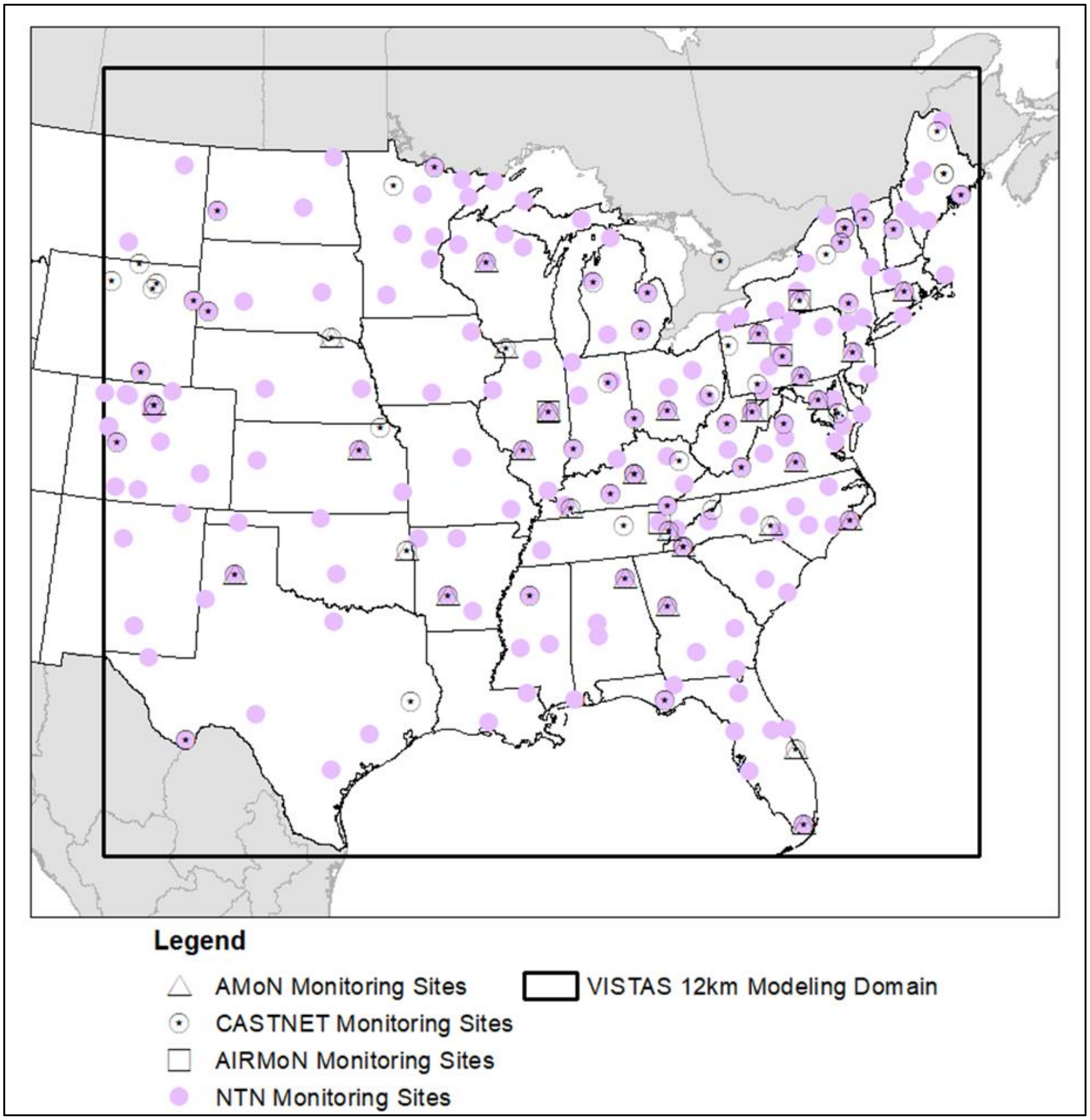


Figure 6-5: Deposition Monitors Included in the VISTAS 12 Domain

Table 6-2 summarizes the aggregated weekly MPE metrics for wet deposition in the VISTAS 12-km domain. The model demonstrates a negative mean bias for the ammonium ion (NH_4^+) and the sulfate ion (SO_4^{-2}) and a positive mean bias for the nitrate ion (NO_3^-) compared to the weekly NTN observations. The AIRMon sites have a larger positive mean bias for all pollutants.

Table 6-2: Weekly Wet Deposition MPE Metrics for NADP Sites in the VISTAS 12-km Domain

Network	Pollutant	n	MB (kg/ha)	ME (kg/ha)	NMB (%)	NME (%)	r (unitless)	MFB (%)	MFE (%)	RMSE (unitless)
NTN	NH_4^+	3,404	-0.025	0.045	-32%	58%	0.629	-19%	34%	0.092
NTN	NO_3^-	3,404	0.024	0.123	12%	62%	0.642	6%	29%	0.242
NTN	SO_4^{-2}	3,404	-0.001	0.118	0%	57%	0.681	0%	29%	0.245
AIRMon	NH_4^+	158	-0.003	0.020	-31%	76%	0.534	-7%	41%	0.041
AIRMon	NO_3^-	158	0.051	0.097	67%	127%	0.398	25%	47%	0.192
AIRMon	SO_4^{-2}	158	0.018	0.091	20%	100%	0.352	9%	46%	0.197

When considering the total accumulated wet deposition for the calendar year, there is still under prediction of NH_4^+ and SO_4^{2-}, and a slight over prediction of NO_3^-. However, continued improvement is seen from the seasonal accumulated performance with respect to the NME and r values, as presented in Table 6-3.

Table 6-3: Accumulated Annual Wet Deposition MPE Metrics for NADP Sites in the VISTAS 12-km Domain

Pollutant	n	MB (kg/ha)	MGE (kg/ha)	NMB (%)	NME (%)	r (unitless)	MFB (%)	MFE (%)	RMSE (unitless)
NH_4^+	99	-1.245	1.246	-38%	38%	0.861	-23%	23%	1.536
NO_3^-	99	0.134	1.453	2%	17%	0.901	1%	8%	1.933
SO_4^{2-}	99	-0.585	1.604	-7%	18%	0.916	-3%	9%	2.142

The weekly dry deposition MB and ME presented in Table 6-4 would seem to suggest relatively good model performance for the CASTNET sites. The higher normalized mean and mean fractional bias and error values are due to small values in the denominator.

Table 6-4: Weekly Dry Deposition MPE Metrics for CASTNet Sites in the VISTAS 12-km Domain

Network	Pollutant	n	MB (kg/ha)	ME (kg/ha)	NMB (%)	NME (%)	r (unitless)	MFB (%)	MFE (%)	RMSE (unitless)
CASTNet	Cl^-	965	-0.001	0.001	-87%	89%	0.796	-77%	79%	0.004
CASTNet	NH_4^+	965	0.001	0.003	13%	51%	0.603	6%	24%	0.004
CASTNet	SO_4^{2-}	965	0.0004	0.007	3%	43%	0.650	1%	21%	0.009
CASTNet	SO_2	965	-0.031	0.031	-96%	96%	0.656	-93%	93%	0.052
CASTNet	NO_3^-	965	0.001	0.004	12%	80%	0.601	6%	37%	0.006
CASTNet	HNO_3	965	-0.062	0.062	-95%	95%	0.612	-90%	90%	0.077
AMoN	NH_3	355	-0.007	0.007	-95%	95%	0.463	9%1	91%	0.013

As presented in Table 6-5, most pollutants, except for NO_3, are under predicted, based on the total accumulated dry deposition. SO_2 and HNO_3 have the worst under prediction of all the pollutants, followed by Cl^-.

Table 6-5: Accumulated Annual Wet Deposition MPE Metrics for CASTNet Sites in the VISTAS 12-km Domain

Pollutant	n	MB (kg/ha)	MGE (kg/ha)	NMB (%)	NME (%)	r (unitless)	MFB (%)	MFE (%)	RMSE (unitless)
Cl^-	19	-0.054	0.054	-88%	88%	0.981	-78%	78%	0.156
NH_4^+	19	-0.002	0.077	-1%	27%	0.688	0%	14%	0.090
SO_4^{2-}	19	-0.067	0.219	-8%	27%	0.537	-4%	14%	0.268
SO_2	19	-1.616	1.616	-97%	97%	0.869	-94%	94%	2.221
NO_3^-	19	0.001	0.113	1%	46%	0.572	0%	23%	0.154
HNO_3	19	-3.272	3.272	-95%.4	95%	0.607	-91%	91%	3.688

Additional details on the wet and dry acid deposition model performance evaluation can be found in Appendix E-4.

6.3. PM Model Performance Goals and Criteria

Because $PM_{2.5}$ is a mixture, the current EPA PM modeling guidance[38] recommends that a meaningful performance evaluation should include an assessment of how well the model is able to predict individual chemical components that constitute $PM_{2.5}$. Consistent with EPA's performance evaluation of the regional haze 2028 analysis, in addition to total $PM_{2.5}$, the following components of $PM_{2.5}$ were also examined.

- Sulfate ion (SO_4^{2-})
- Nitrate ion (NO_3^-)
- Ammonium ion (NH_4^+)
- Elemental Carbon (EC)
- Organic Carbon (OC) and/or Organic Carbon Mass (OCM)
- Crustal (weighted average of the most abundant trace elements in ambient air)
- Sea salt constituents (Na^+ and Cl^-)

Recommended benchmarks for photochemical model performance statistics (Boylan, 2006; Emery, 2017) were used to assess the applicability of the VISTAS modeling platform for Regional Haze SIP purposes. The goal and criteria values noted in Table 6-6 below were used for this modeling.

Table 6-6: Fine Particulate Matter Performance Goals and Criteria

Species	NMB, Goal	NMB, Criteria	NME, Goal	NME, Criteria
24-hr $PM_{2.5}$ and sulfate	<± 10%	<± 30%	< 35%	< 50%
24-hr nitrate	<± 10%	<± 65%	< 65%	< 115%
24-hr OC	<± 15%	<± 50%	< 45%	< 65%
24-hr EC	<± 20%	<± 40%	< 50%	< 75%

[38] URL: https://www.epa.gov/sites/production/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

The mapping of the CAMx species into the observed species are presented in Table 6-7.

Table 6-7: Species Mapping from CAMx into Observation Network

Network	Observed Species	CAMx Species
IMPROVE	NO_3	PNO3
IMPROVE	SO_4	PSO4
IMPROVE	NH_4	PNH4
IMPROVE	OM = 1.8*OC	SOA1+SOA2+SOA3+SOA4 +SOPA+SOPB+POA
IMPROVE	EC	PEC
IMPROVE	SOIL	FPRM+FCRS
IMPROVE	$PM_{2.5}$	PSO4+PNO3+PNH4+SOA1+SOA2+SOA3+SOA4 +SOPA+SOPB+POA+PEC+FPRM+FCRS+NA+PCL
CSN	$PM_{2.5}$	PSO4+PNO3+PNH4+SOA1+SOA2+SOA3+SOA4 +SOPA+SOPB+POA+PEC+FPRM+FCRS+NA+PCL
CSN	NO_3	PNO3
CSN	SO_4	PSO4
CSN	NH_4	PNH4
CSN	OM = 1.4*OC	SOA1+SOA2+SOA3+SOA4 +SOPA+SOPB+POA
CSN	EC	PEC

Several graphic displays of model performance were prepared, including:

- Performance goal plots ("soccer plots") that summarize model performance by species, region, and season.
- Concentration performance plots ("bugle plots") that display fractional bias or error as a function of concentration by species, region, monitoring network, and month.
- Scatter plots of predicted and observed concentrations by species, monitoring network, and month.
- Time series plots of predicted and observed concentrations by species, monitoring site, and month.
- Spatially averaged time series plots.
- Time series plots of monthly fractional bias and error by species, region, and network.

Both soccer plots and bugle plots offer a convenient way to examine model performance with respect to set goals and criteria. The bugle plots have the added benefit of adjusting the goals and criteria to consider the concentration of the species. Analysis of bugle plots generally suggests that greater emphasis should be placed on performance of those components with the greatest contribution to PM mass and visibility impairment (e.g., sulfate and organic carbon) and that greater bias and error could be accepted for components with smaller contributions to total PM mass (e.g., elemental carbon, nitrate, and soil).

6.4. PM Model Performance Evaluation for the VISTAS Modeling Domain

Further discussion of model performance in this document will focus on the comparison of observational data from the CASTNET, CSN, and IMPROVE monitors (Table 6-8) in the VISTAS12 modeling domain and model output data from the VISTAS2011 annual air quality modeling.

Table 6-8: Overview of Utilized Ambient Data Monitoring Networks

Monitoring Network	Chemical Species Measured	Sampling Period
IMPROVE	Speciated $PM_{2.5}$ and PM_{10}; light extinction data	1 in 3 days; 24-hour average
CASTNET	Speciated $PM_{2.5}$, and O_3	1-week average
CSN	Speciated $PM_{2.5}$	24-hour average

The evaluation primarily focused on the air quality model's performance with respect to individual components of fine particulate matter, as good model performance of the component species will dictate good model performance of total or reconstituted fine particulate matter. Model performance of the total fine particulate matter and the resulting total light extinction was also examined as a means to discuss the overall model performance. A full list of model performance statistics is found in Appendix E-3.

The soccer plots for all VISTAS and non-VISTAS monitors are included here for summary purposes. Plots have been developed for the monthly average performance statistics for the most significant light scattering component species (i.e. sulfate, nitrate, organic carbon, and elemental carbon).

The soccer plots of monthly concentrations show values for $PM_{2.5}$ (Figure 6-6) at CSN, IMPROVE monitors and sulfate (Figure 6-7), nitrate (Figure 6-8), organic carbon (Figure 6-9), and elemental carbon (Figure 6-10) at CSN, IMPROVE, CASTNET monitors in VISTAS and non-VISTAS states in the modeling domain. $PM_{2.5}$ is mostly inside the NMB and NME criteria for CSN/VISTAS, CSN/non-VISTAS, IMPROVE/VISTAS, and IMPROVE/non-VISTAS. Sulfate is mostly inside the NMB and NME criteria for CSN/VISTAS, CSN/non-VISTAS, IMPROVE/VISTAS, and IMPROVE/non-VISTAS; but mostly outside the NMB and NME criteria for CASTNet/VISTAS and CASTNet/non-VISTAS. Nitrate is mostly inside the NMB and NME criteria for CASTNet/VISTAS, CASTNet/non-VISTAS, CSN/VISTAS, CSN/non-VISTAS, IMPROVE/VISTAS, and IMPROVE/non-VISTAS. Organic carbon is mostly inside the NMB and NME criteria for IMPROVE/VISTAS and IMPROVE/non-VISTAS; but mostly outside the NMB and NME criteria for CSN/VISTAS and CSN/non-VISTAS. Elemental carbon is mostly inside the NMB and NME criteria for CSN/VISTAS, IMPROVE/VISTAS, and IMPROVE/non-VISTAS; but mostly outside the NMB and NME criteria for and CSN/non-VISTAS.

Figure 6-6 contains soccer plots of NMB and NME for total $PM_{2.5}$ at CSN and IMPROVE monitors. Most CSN values are within the NMB and NME criteria. For IMPROVE, four months are outside the NMB and NME criteria for the VISTAS states and six months are outside the NMB and NME criteria for the non-VISTAS states.

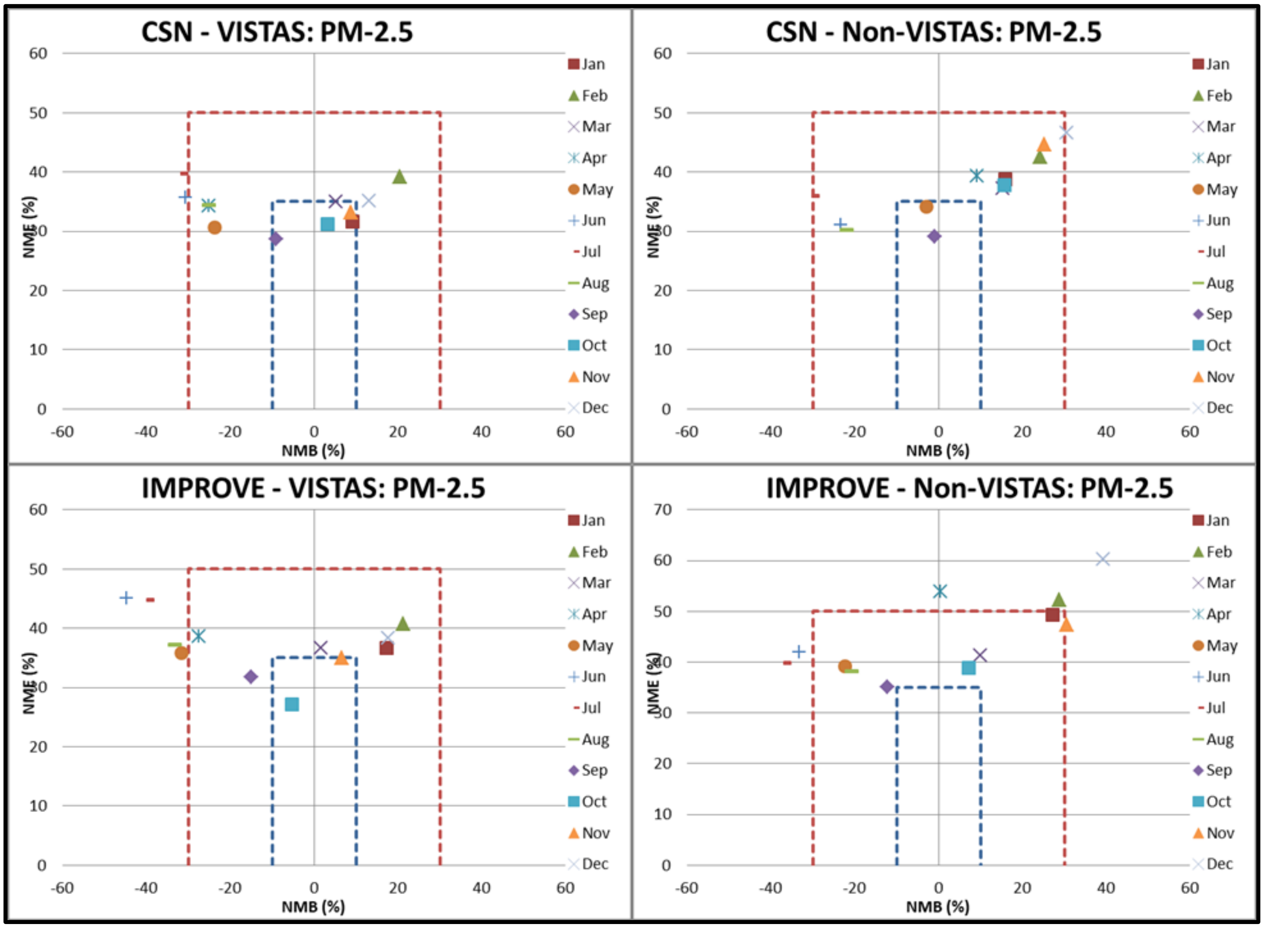


Figure 6-6: Soccer Plots of Total $PM_{2.5}$ by Network and Month for VISTAS and Non-VISTAS Sites

Figure 6-7 contains soccer plots of NMB and NME for sulfate at CASTNET, CSN, and IMPROVE monitors. For CASTNet, seven months are outside the NMB and NME criteria for the VISTAS states and seven months are outside the NMB and NME criteria for the non-VISTAS states. Most CSN values are within the NMB and NME criteria. For IMPROVE, two months are outside the NMB and NME criteria for the VISTAS states and no months are outside the NMB and NME criteria for the non-VISTAS states.

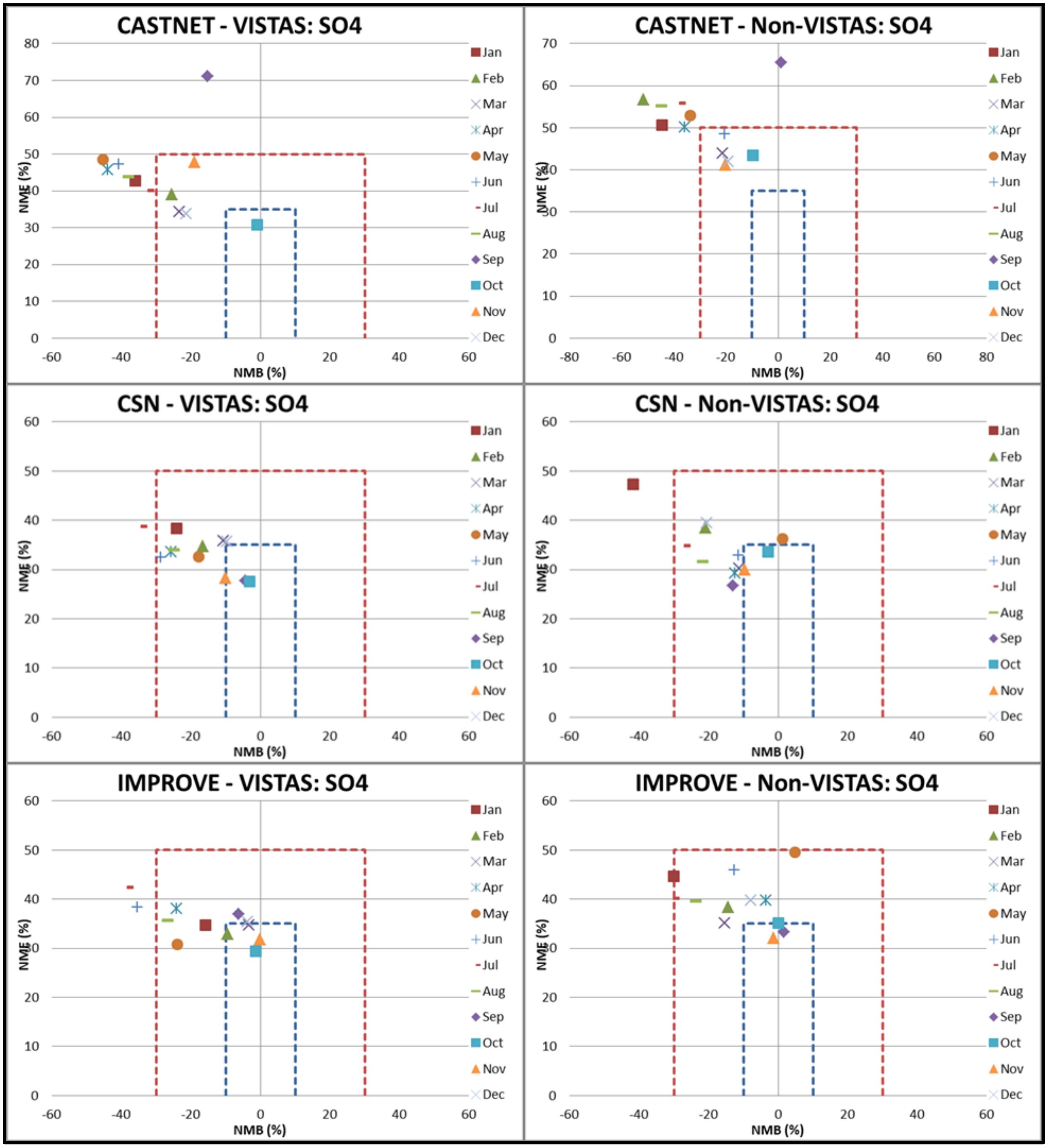


Figure 6-7: Soccer Plots by Network and Month for VISTAS and Non-VISTAS Sites

Figure 6-8 contains soccer plots of NMB and NME for nitrate at CASTNET, CSN, and IMPROVE monitors. Most CASTNet and CSN values are within the NMB and NME criteria. For IMPROVE, two months are outside the NMB and NME criteria for the VISTAS states and one month is outside the NMB and NME criteria for the non-VISTAS states.

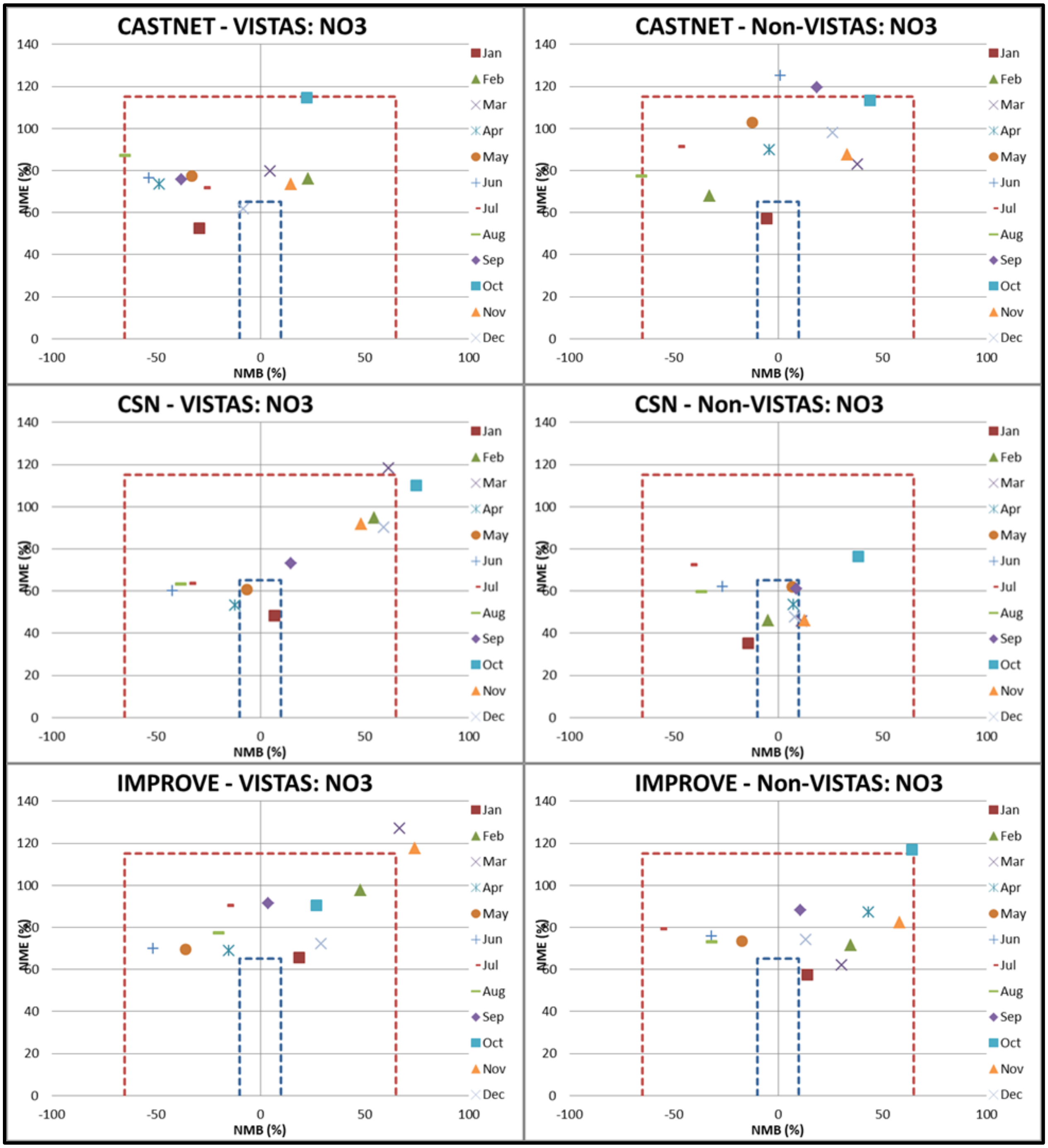


Figure 6-8: Soccer Plots of Nitrate by Network and Month for VISTAS and Non-VISTAS Sites

Figure 6-9 contains soccer plots of NMB and NME for organic carbon at CASTNET, CSN, and IMPROVE monitors. Most CSN values are outside the NMB and NME criteria. For IMPROVE, no months are outside the NMB and NME criteria for the VISTAS states and four months are outside the NMB and NME criteria for the non-VISTAS states.

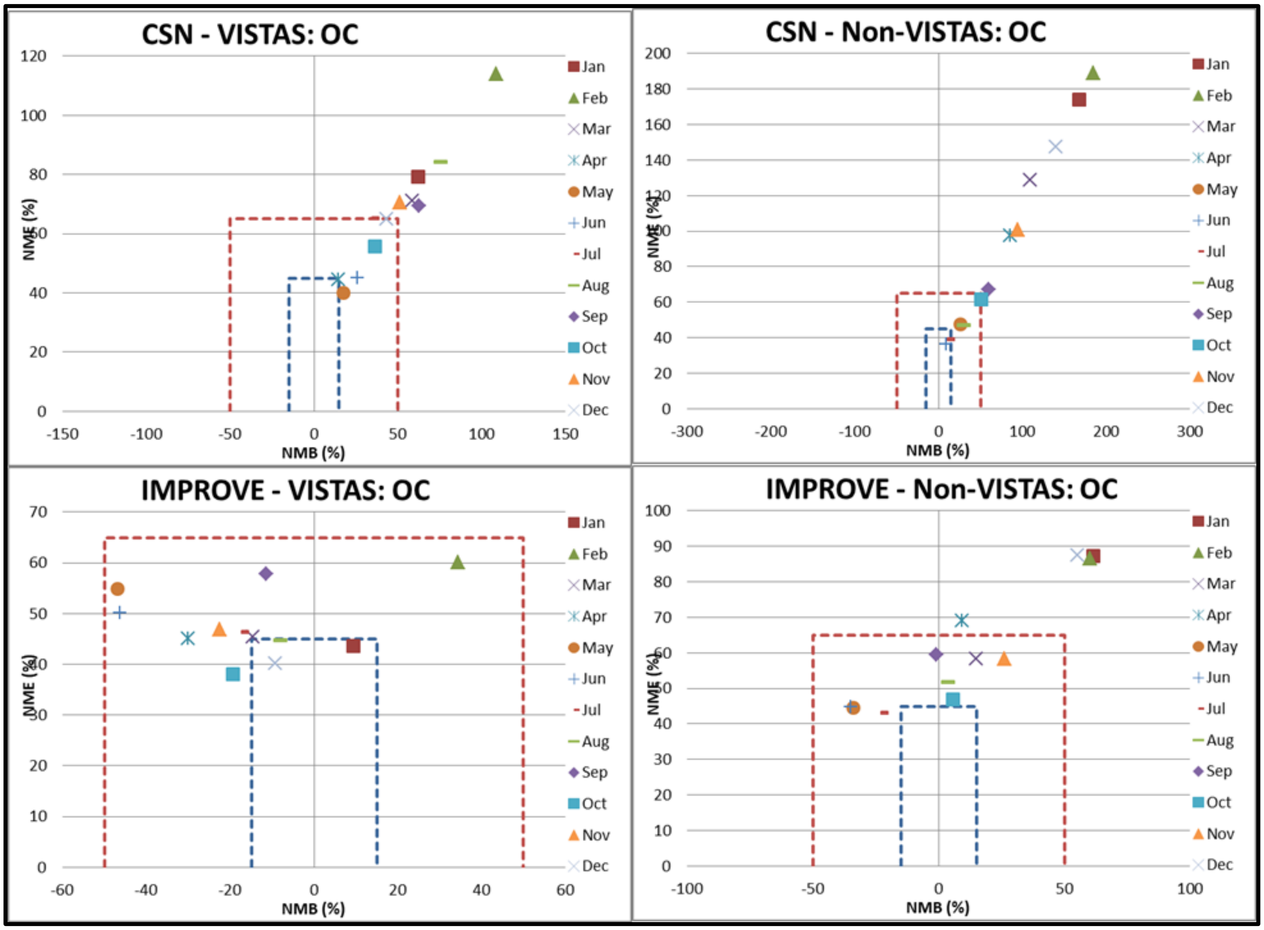


Figure 6-9: Soccer Plots of OC by Network and Month for VISTAS and Non-VISTAS Sites

Figure 6-10 contains soccer plots of NMB and NME for elemental carbon at CASTNET, CSN, and IMPROVE monitors. For CSN, two months are outside the NMB and NME criteria for the VISTAS states and six months are outside the NMB and NME criteria for the non-VISTAS states. For IMPROVE, one month is outside the NMB and NME criteria for the VISTAS states and five months are outside the NMB and NME criteria for the non-VISTAS states.

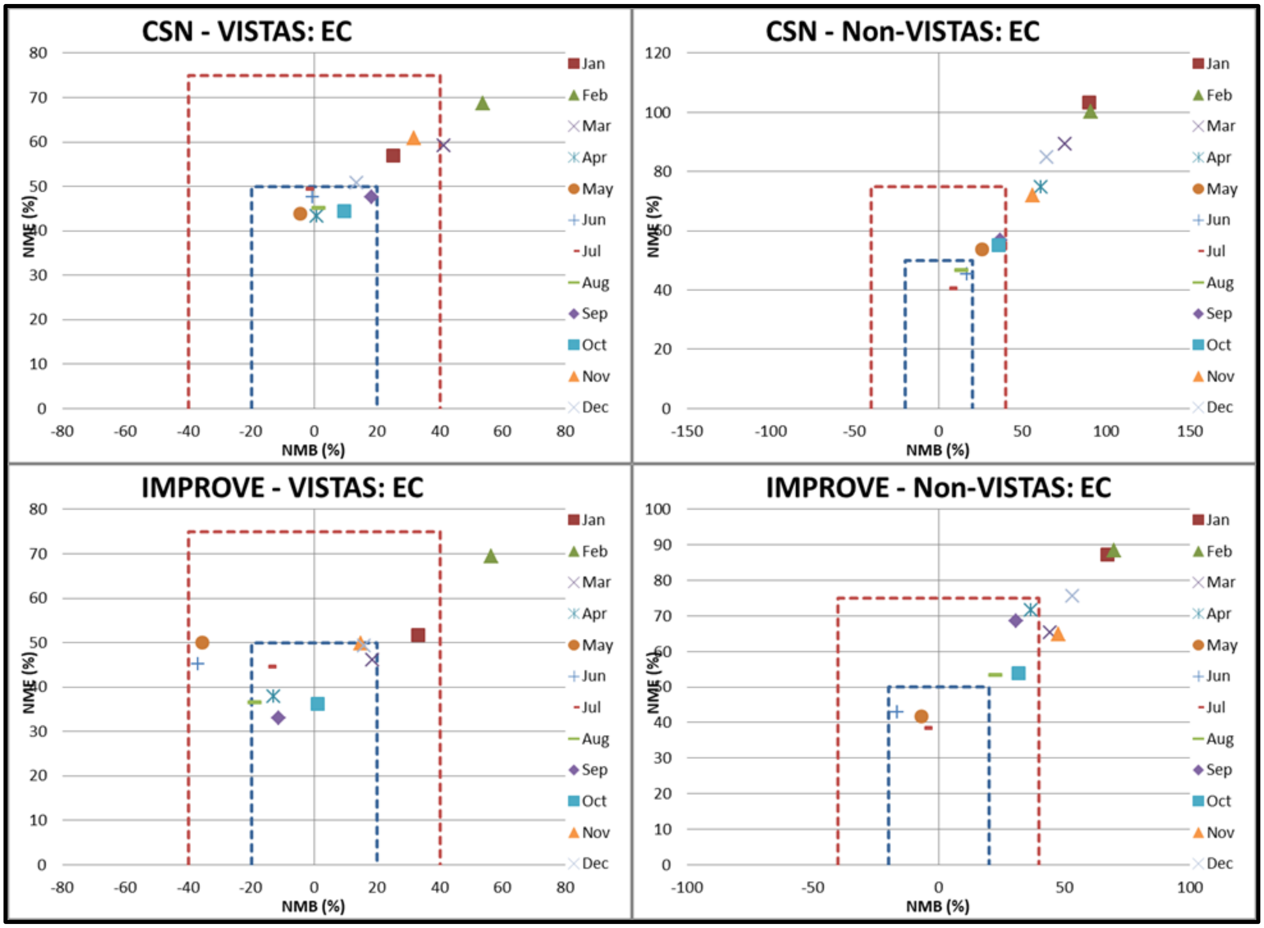


Figure 6-10: Soccer Plots of EC by Network and Month for VISTAS and Non-VISTAS Sites

Spatial plots summarizing IMPROVE observations and model NMB on the 20% most-impaired days are shown in Figure 6-11 through Figure 6-16. In each figure the top graphic presents the observed concentration and the bottom graphic presents the NMB.

For sulfate (Figure 6-11), predictions on the 20% most-impaired days are biased low across all regions, with the most significant percentage under predictions occurring in the southwest quarter of the VISTAS12 modeling domain. Some isolated over predictions are observed in a few Class I areas near the outer domain boundaries and in the northeast.

Predictions of nitrate (Figure 6-12) on the 20% most-impaired days in the VISTAS12 modeling domain are mixed with a high positive bias in the north and a mix of negative and positive bias in the southeast.

A general positive bias of OC (Figure 6-13) is observed across the region on the 20% most-impaired days. In the SESARM states the OC has approximately the same NMB at monitors with high observed concentrations as monitors with lower observed concentrations. For EC (Figure

6-14) the model shows a slight under prediction at monitors in the northern portion of the SESARM states and a positive bias at monitors in the southern SESARM region.

On the 20% most-impaired days, model performance for total $PM_{2.5}$ (Figure 6-15) is overall biased low across most quadrants of the VISTAS12 modeling domain (corresponding closely to the sulfate performance). A slight over prediction of $PM_{2.5}$ on those days is observed in the Northern Plains and Upper Midwest, primarily along the Canadian border (corresponding closely to high nitrate concentrations and performance).

Sea salt (Figure 6-16) is generally over predicted along boundaries with ocean water bodies (Atlantic Ocean and Gulf of Mexico) and is expectedly under predicted across the rest of the VISTAS12 modeling domain.

In conclusion, performance assessed at the "one atmosphere" level was deemed acceptable for ozone, wet/dry deposition, and particulate matter at various monitoring sites. Overall, the VISTAS2011 modeling platform was found to be representative and acceptable for use in regulatory modeling applications for ozone, particulate matter, and regional haze.

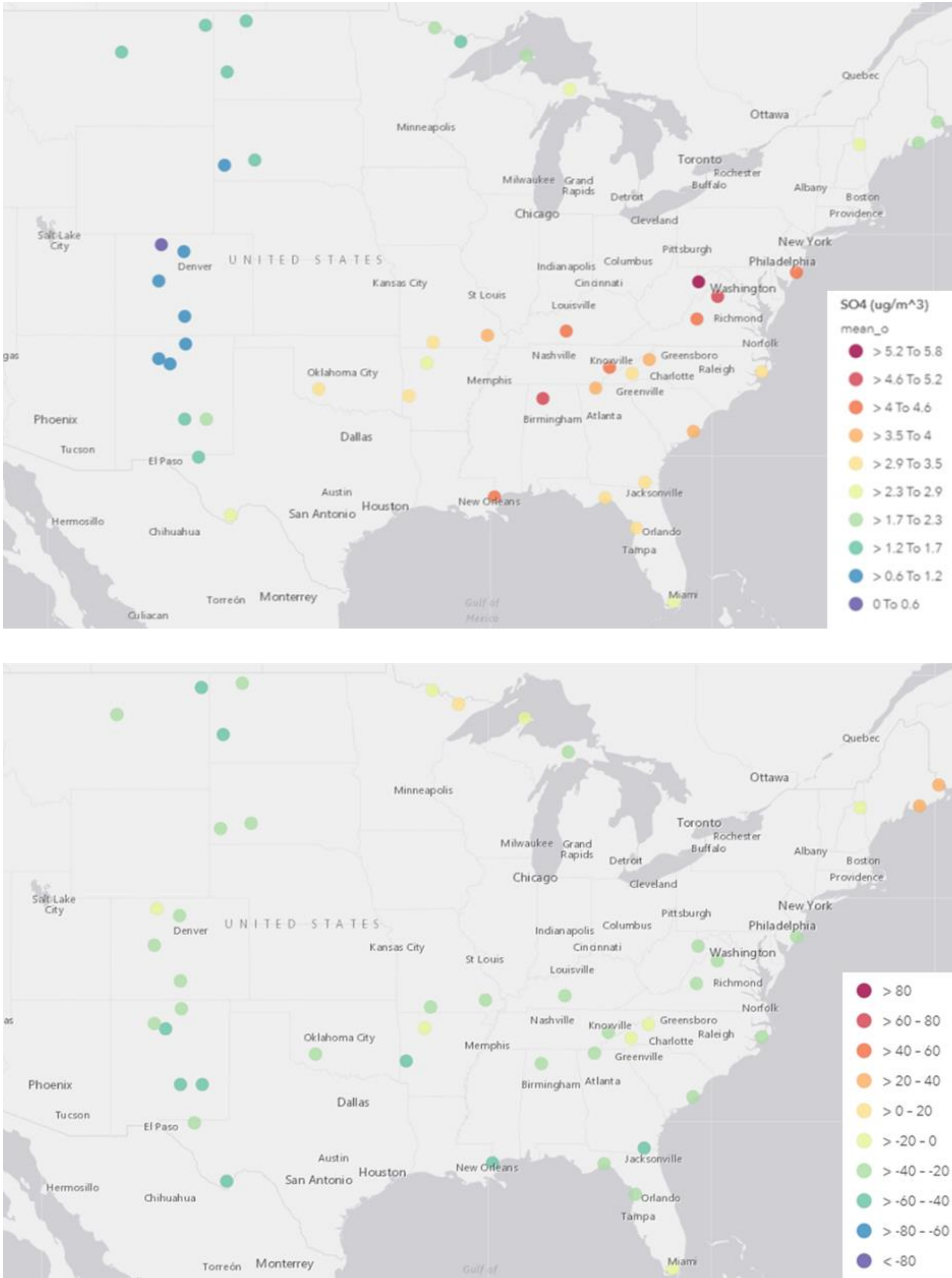
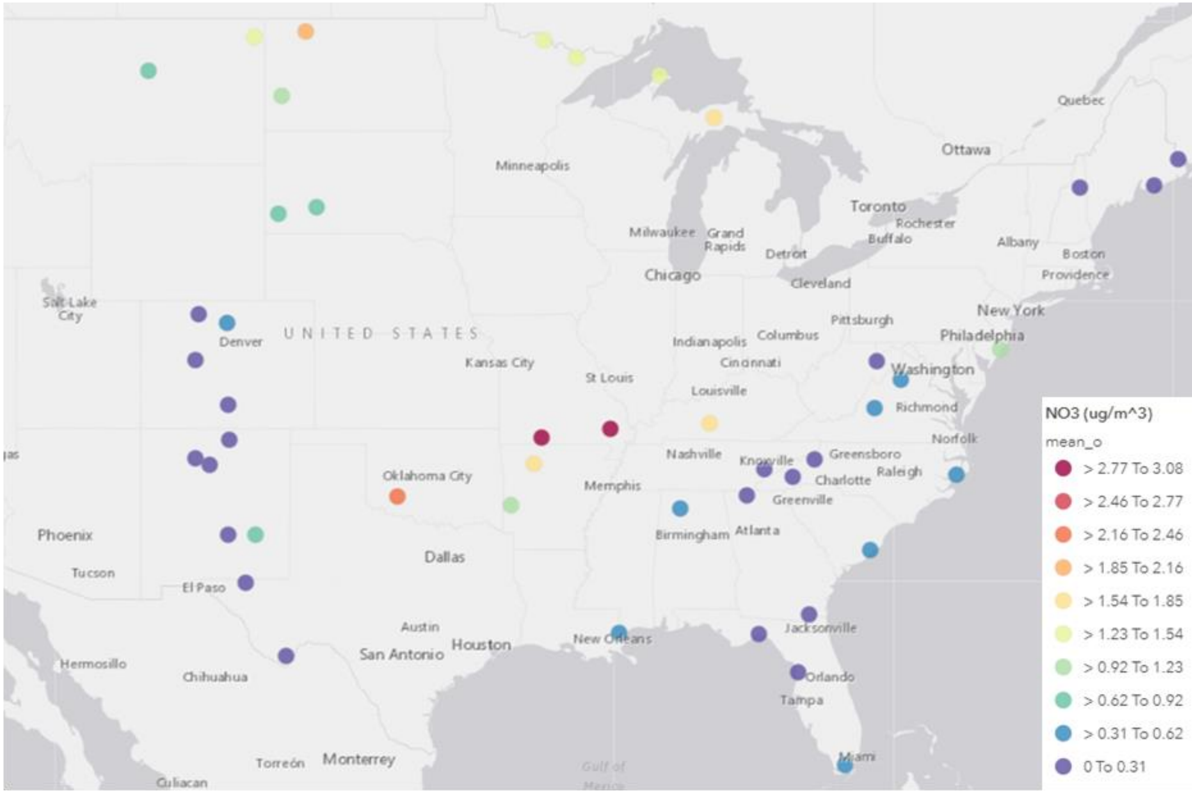


Figure 6-11: Observed Sulfate (Top) and Modeled NMB (Bottom) for Sulfate on the 20% Most-Impaired Days at IMPROVE Monitor Locations



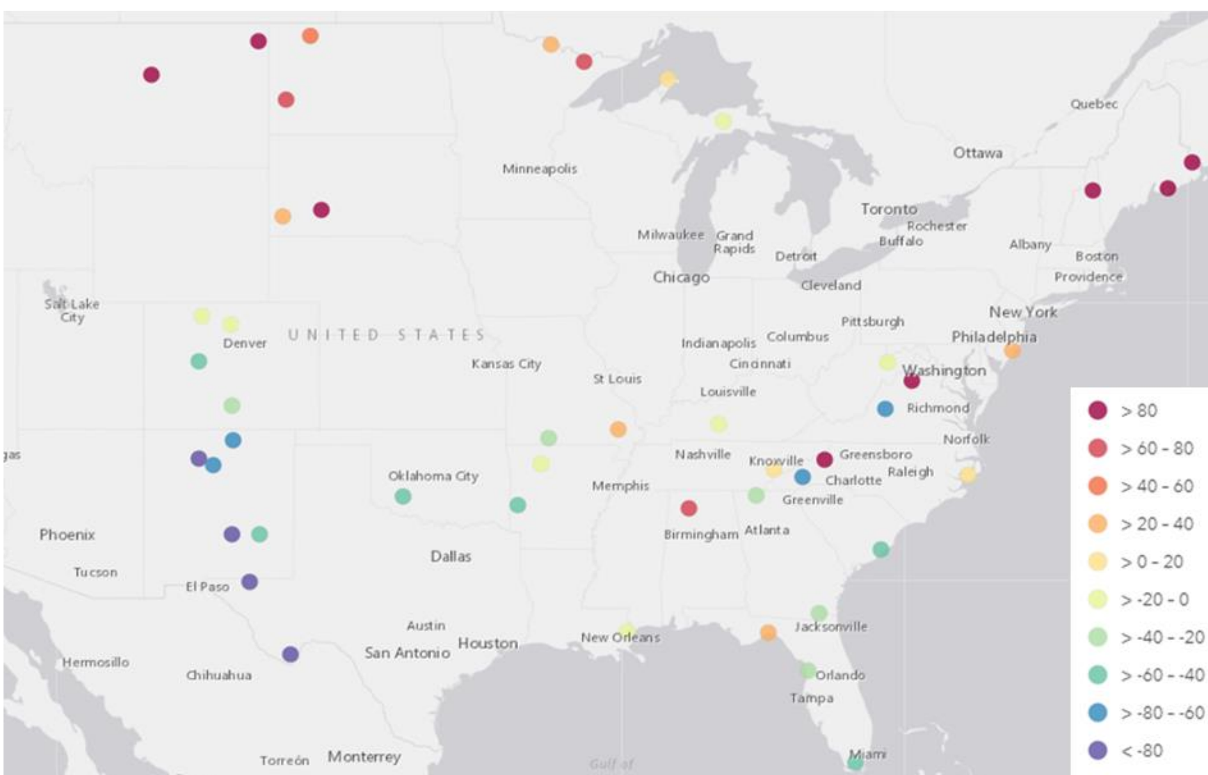


Figure 6-12: Observed Nitrate (Top) and Modeled NMB (Bottom) for Nitrate on the 20% Most Impaired Days at Improve Monitor Locations

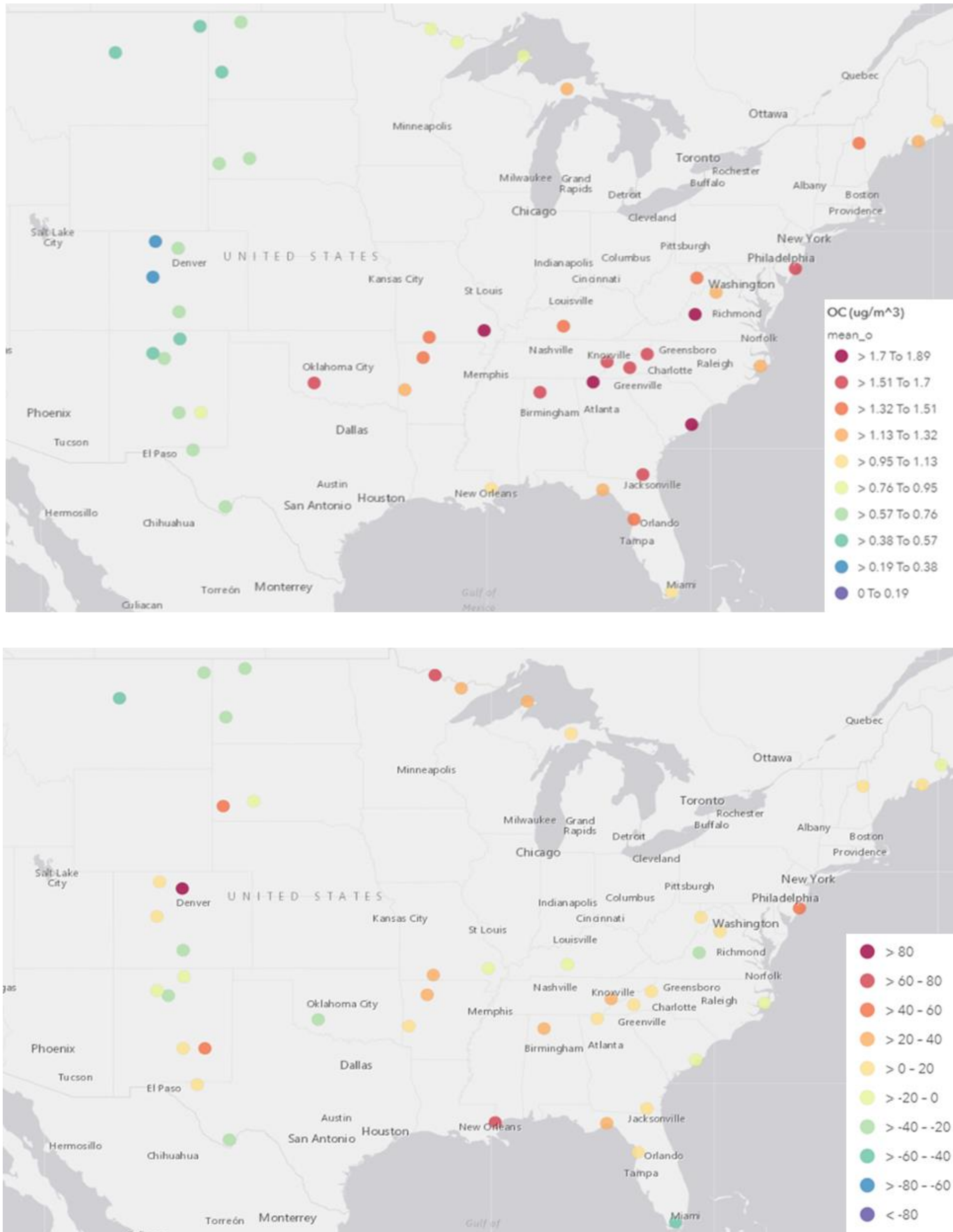


Figure 6-13: Observed OC (Top) and Modeled NMB (Bottom) for OC on the 20% Most-Impaired Days at IMPROVE Monitor Locations

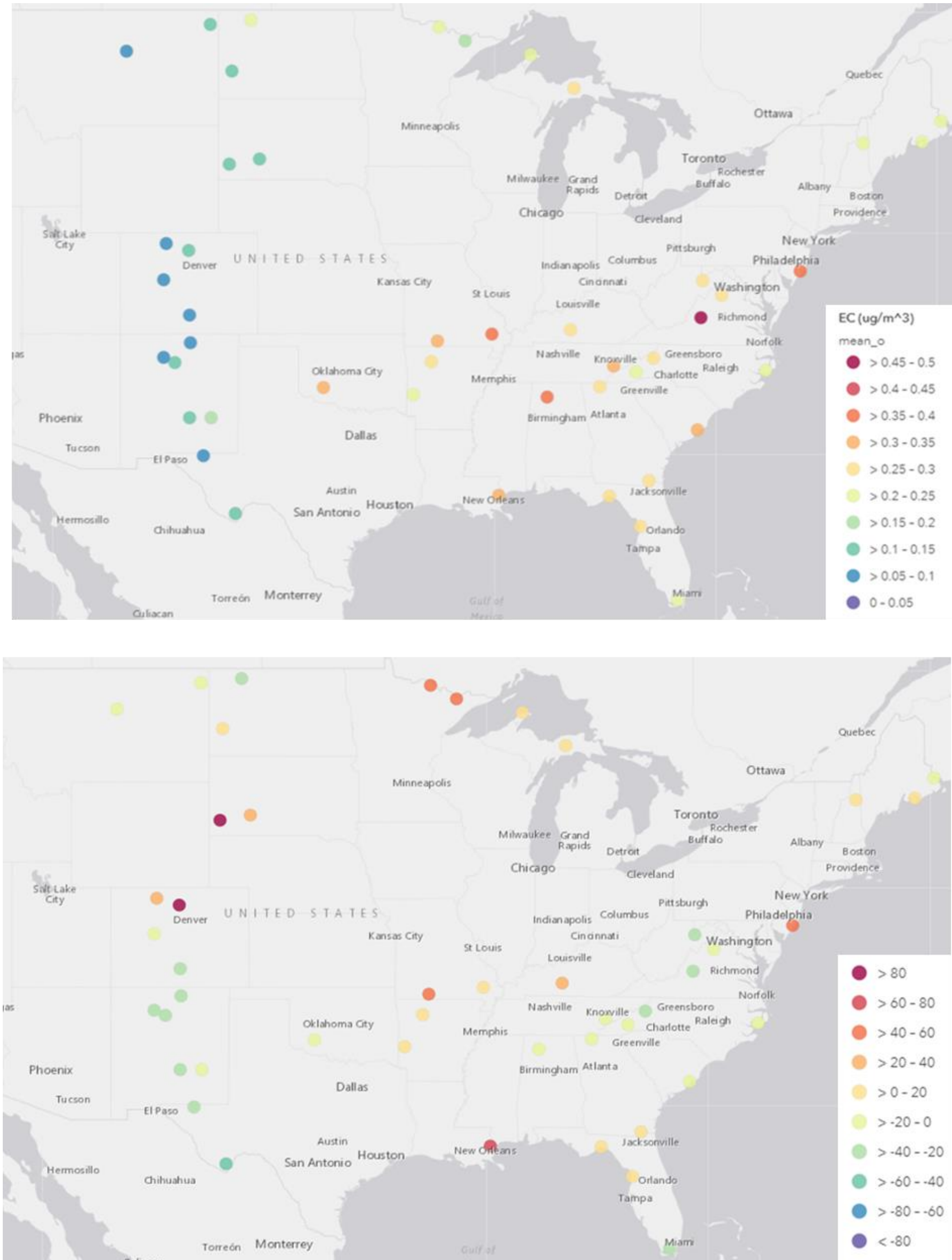


Figure 6-14: Observed EC (Top) and Modeled NMB (Bottom) for EC on the 20% Most-Impaired Days at IMPROVE Monitor Locations

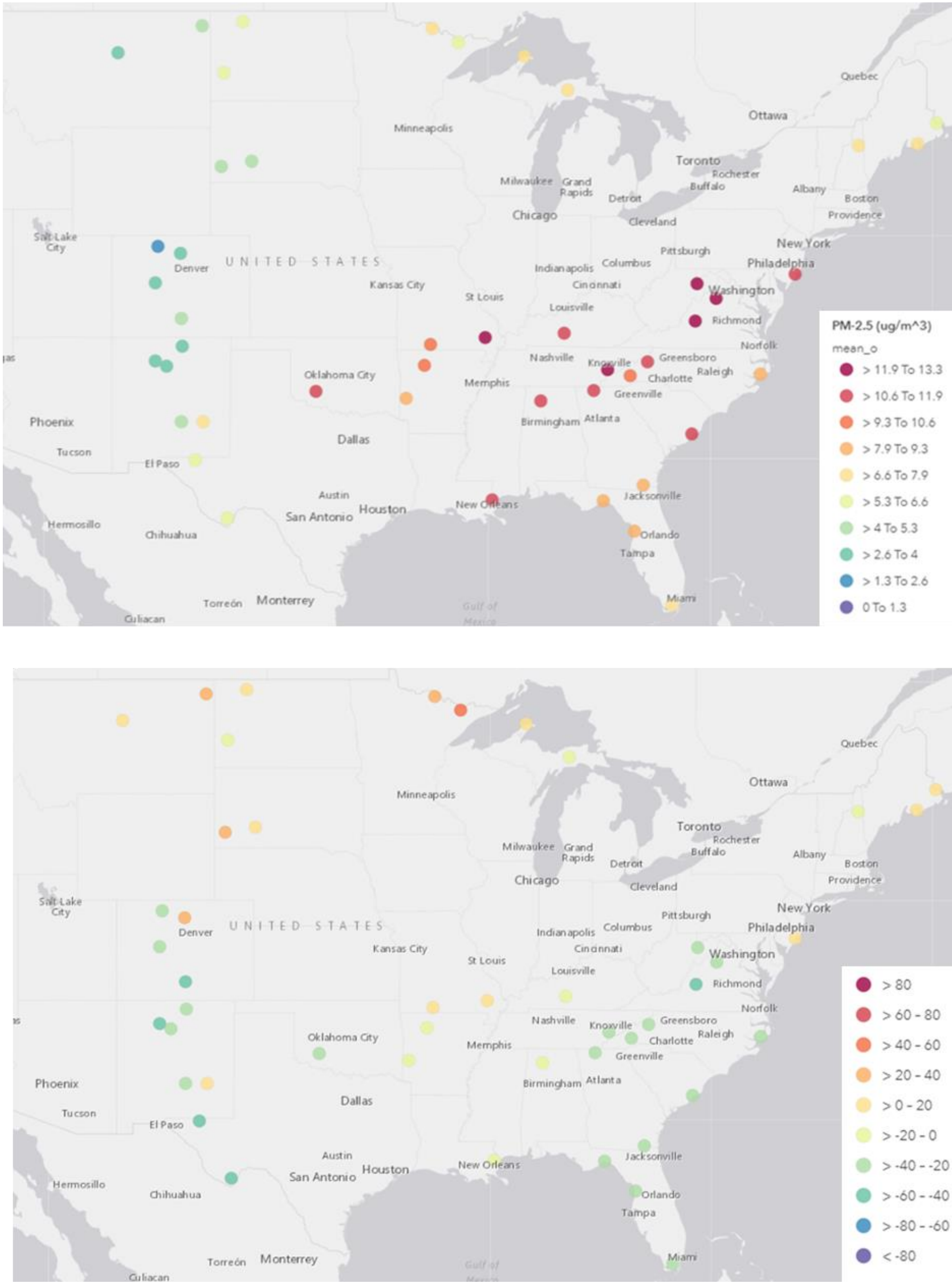


Figure 6-15: Observed Total $PM_{2.5}$ (Top) and Modeled NMB (Bottom) for Total $PM_{2.5}$ on the 20% Most-Impaired Days at IMPROVE Monitor Locations

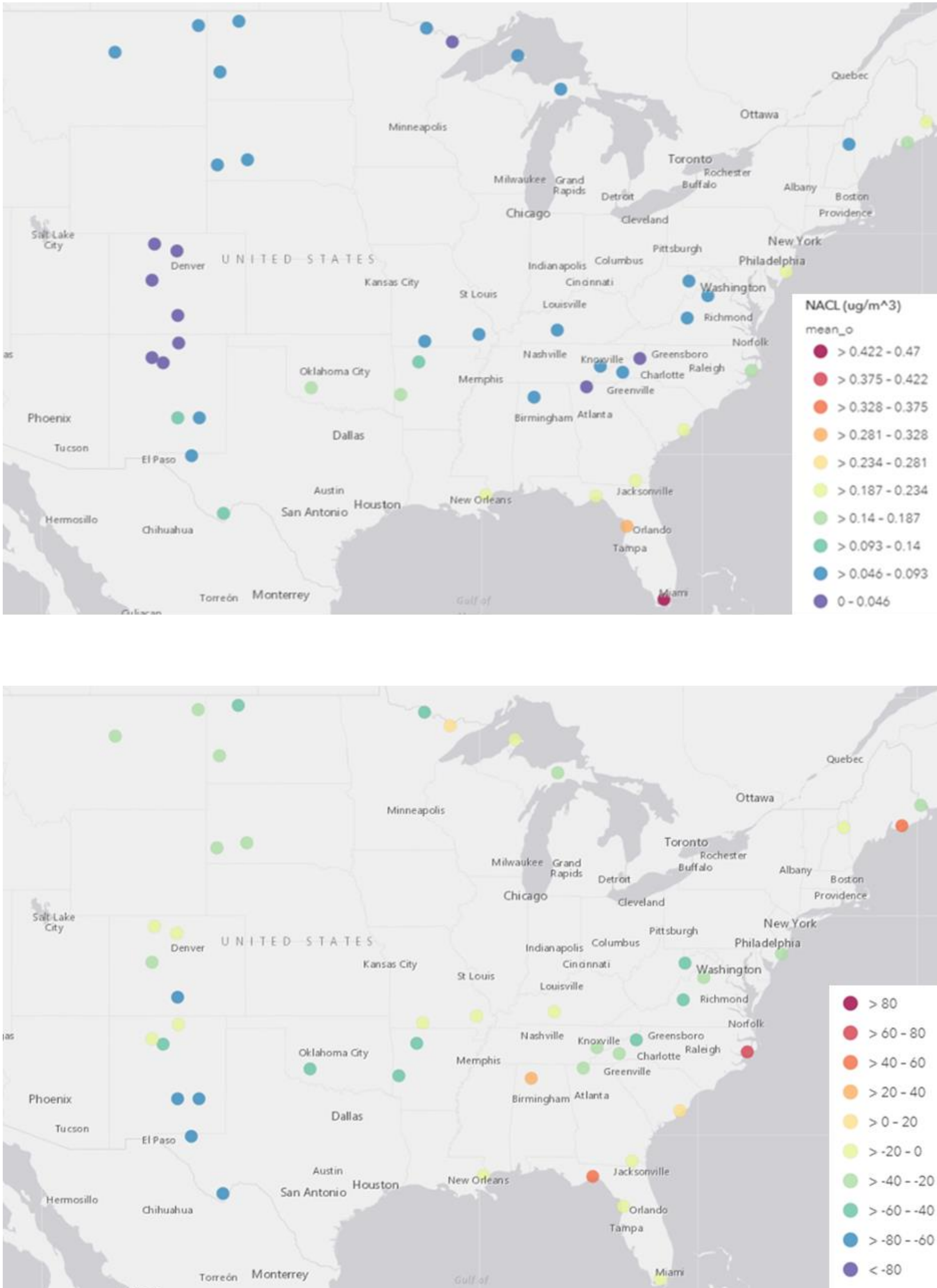


Figure 6-16: Observed Sea Salt (Top) and Modeled NMB (Bottom) for Sea Salt on the 20% Most-Impaired Days at IMPROVE Monitor Locations

6.5. PM Model Performance Evaluation for Class I Areas in Florida

The following section provides a detailed model performance evaluation for Chassahowitzka, St. Marks, and Everglades. This evaluation includes average stacked bar charts, day-by-day stacked bar charts, scatter plots, soccer plots, and bugle plots for the 20% most-impaired days and 20% clearest days.

Figure 6-17 through Figure 6-22 contain the average stacked bar charts for Chassahowitzka, St. Marks, and Everglades. These figures include (1) observed and modeled mass concentrations of particulate matter constituents and (2) observed and modeled light extinctions constituents on the 20% most-impaired days and the 20% clearest days. The color codes for the stacked bars are:

- Yellow = mass concentrations of or light extinction due to sulfates
- Red = mass concentrations of or light extinction due to nitrates
- Green = mass concentrations of or light extinction due to organic carbon
- Black = mass concentrations of or light extinction due to elemental carbon
- Brown = mass concentrations of or light extinction due to soil
- Blue = mass concentrations of or light extinction due to sea salt
- Gray = mass concentrations of or light extinction due to coarse mass

Overall, modeled and observed $PM_{2.5}$ concentrations and light extinctions at each Class I area match reasonably well on both 20% most-impaired days and clearest days. Although model performance for sulfate at each Class I area is biased low on the 20% most-impaired days, the model performance statistics for sulfate are reasonable for regulatory modeling. Additionally, the future year sulfate concentrations are not based on the absolute modeled values, but instead the model is applied in a relative sense through calculation of relative response factors (RRFs). The RRF is the relative change in sulfates between the base year modeled value and future year modeled value. The future year sulfate concentrations are then estimated by multiplying the base year actual monitored value by the RRF. Factors causing bias in the base case will also affect the future case; therefore, using the modeling in a relative sense resolves any problems posed by the underprediction of sulfates, and will not lead to an under-estimation of source contributions.

Figure 6-23 through Figure 6-34 contain the day-by-day stacked bar charts for Chassahowitzka, St. Marks, and Everglades. These charts allow a side-by-side comparison of observed and modeled speciated PM concentrations and speciated light extinctions on each 20% most-impaired and 20% clearest days. The speciated components are presented in the same order for both the observations (left bar) and modeled data (right bar) to help identify specific days when the predicted mass concentrations or light extinction for the components differ from the observed values. The total height of the bar provides the total particulate matter mass concentrations or the total reconstructed light extinction values. It should be noted that values used for these stacked bar charts are from the grid cell where each IMPROVE monitor is located.

According to Figure 6-17 through Figure 6-34, sulfates and organic carbon, and sometimes coarse mass, are the largest contributors to light extinction in the Florida Class I areas on both the 20% most-impaired days and the 20% clearest days. The stacked bar charts also suggest that nitrates can be of more importance on the 20% clearest days. Model performance discussion for individual species were further examined with scatter plots.

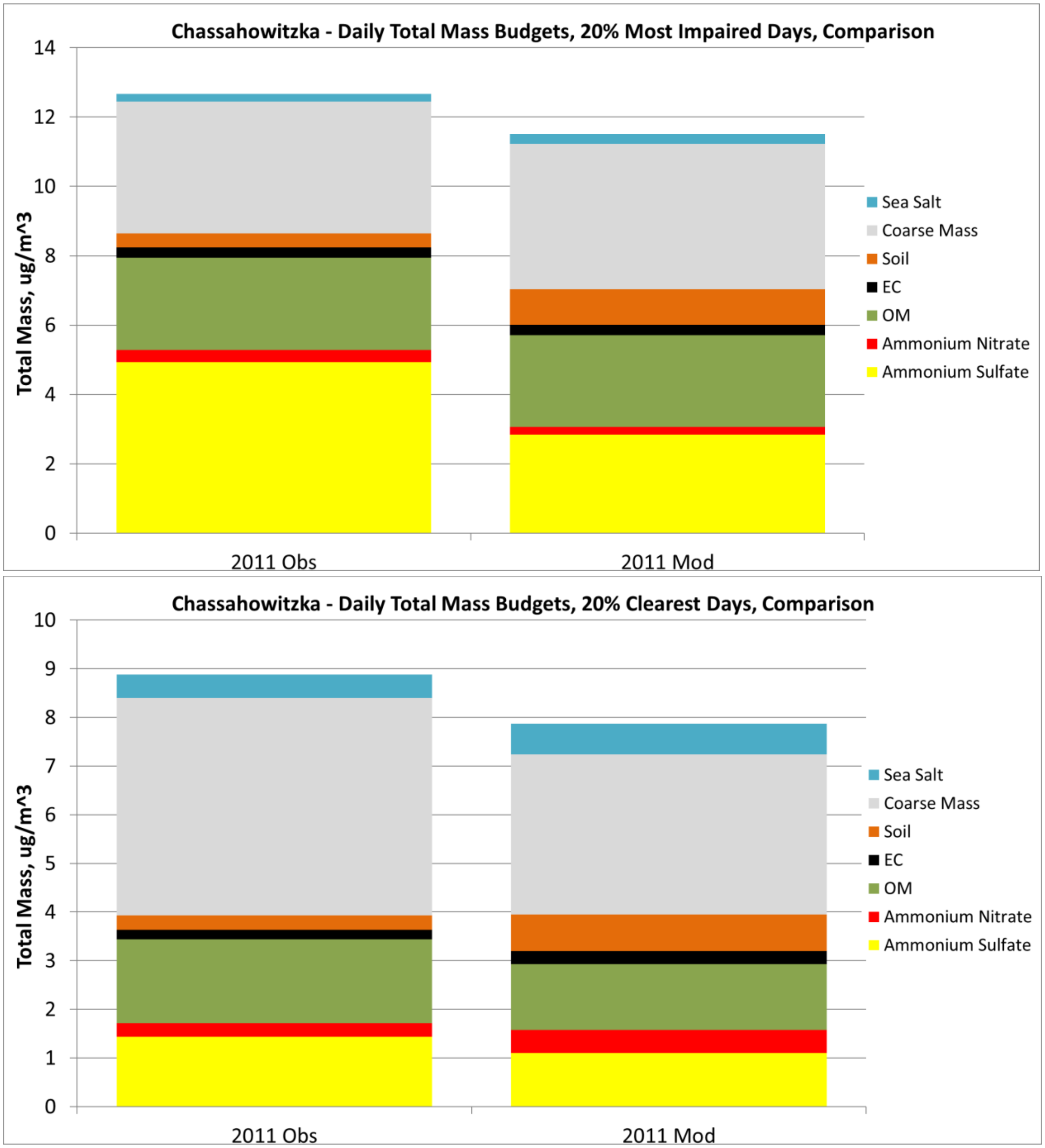


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Figure 6-17: Stacked Bar Charts for Average $PM_{2.5}$ Concentrations on the 20% Most Impaired Days (top) and 20% Clearest Days (bottom) at Chassahowitzka

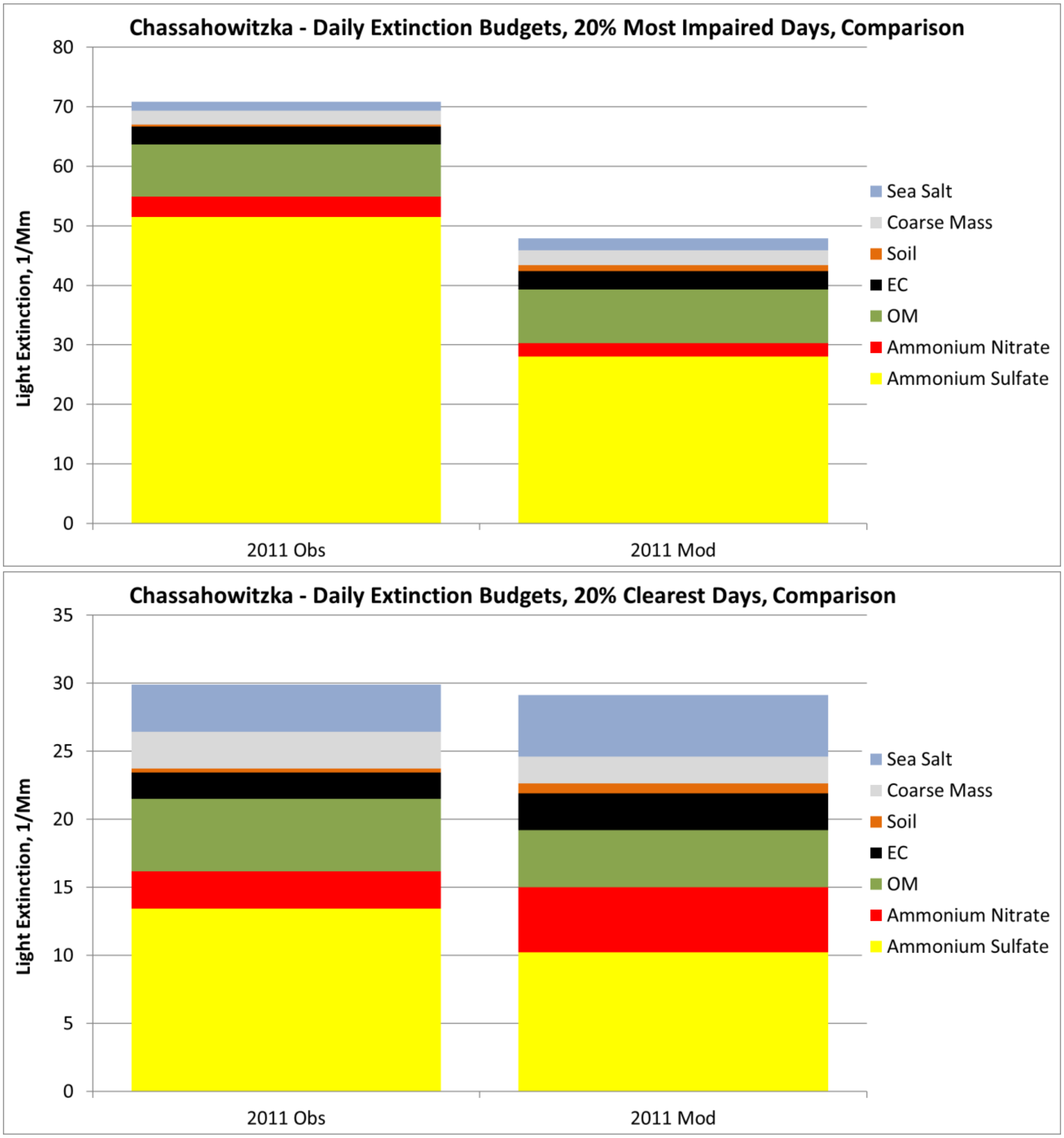


Figure 6-18: Stacked Bar Charts for Average Light Extinction on the 20% Most Impaired Days (top) and 20% Clearest Days (bottom) at Chassahowitzka

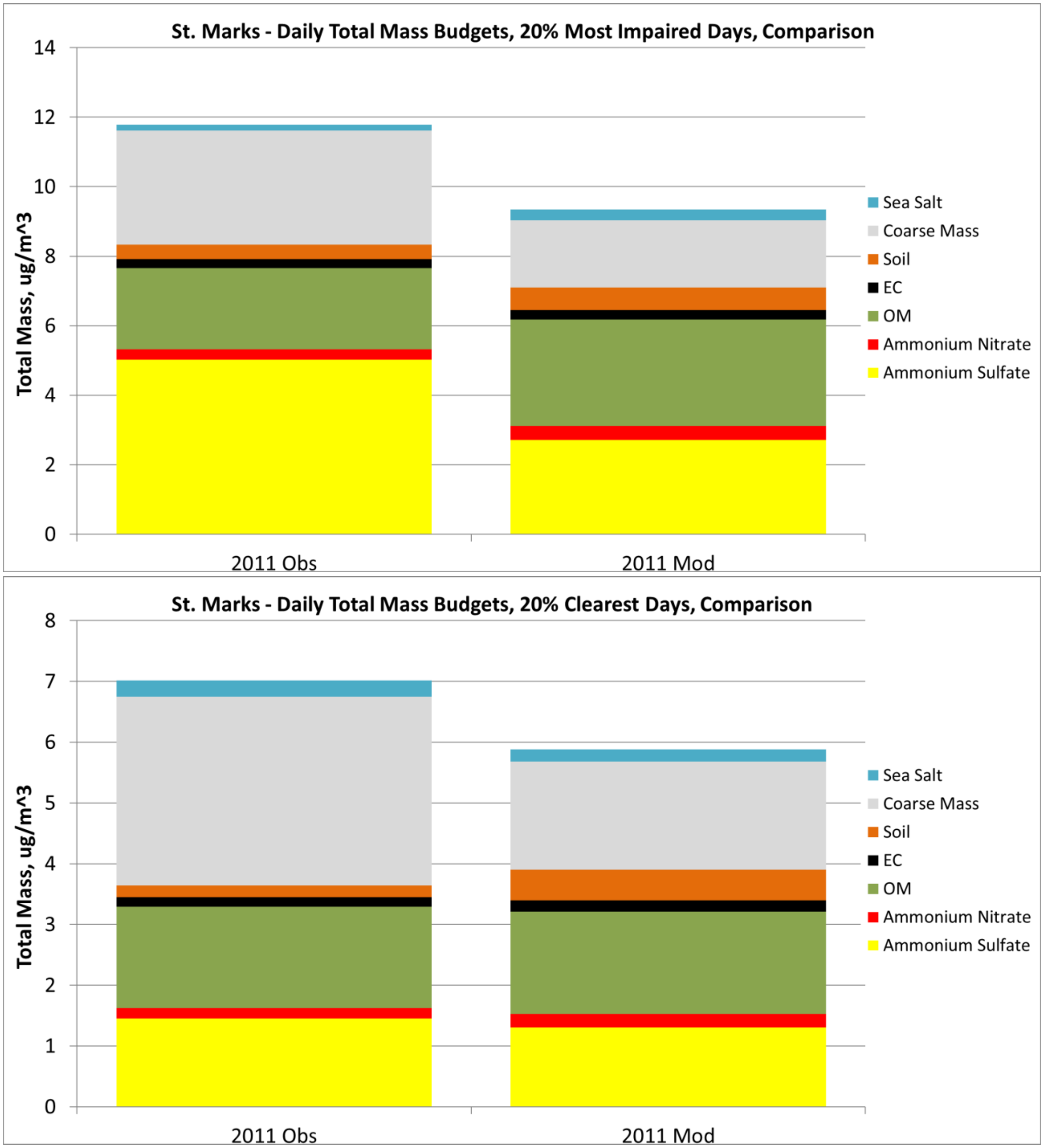


Figure 6-19: Stacked Bar Charts for Average $PM_{2.5}$ Concentrations on the 20% Most Impaired Days (top) and 20% Clearest Days (bottom) at St. Marks

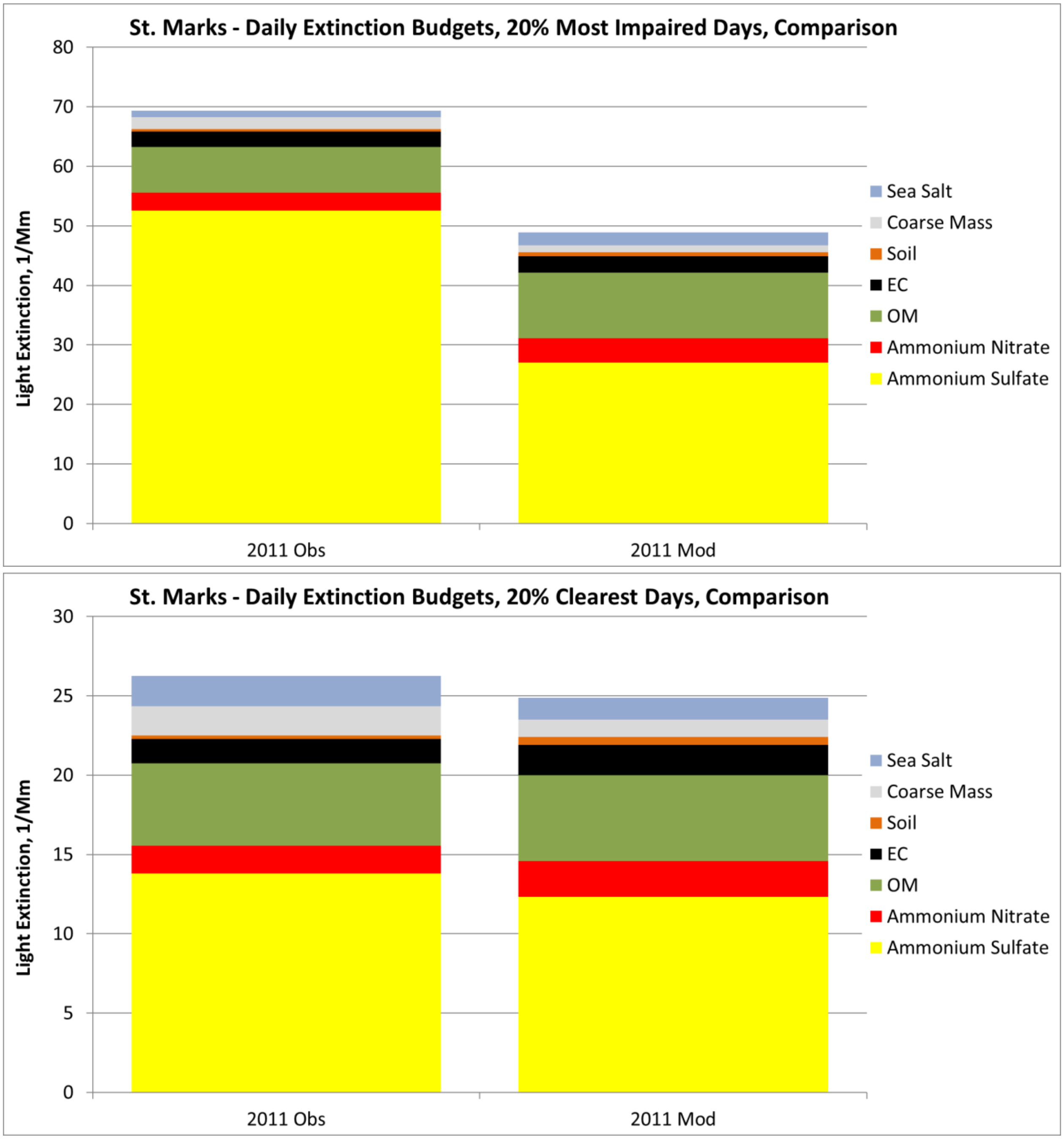


Figure 6-20: Stacked Bar Charts for Average Light Extinction on the 20% Most Impaired Days (top) and 20% Clearest Days (bottom) at St. Marks

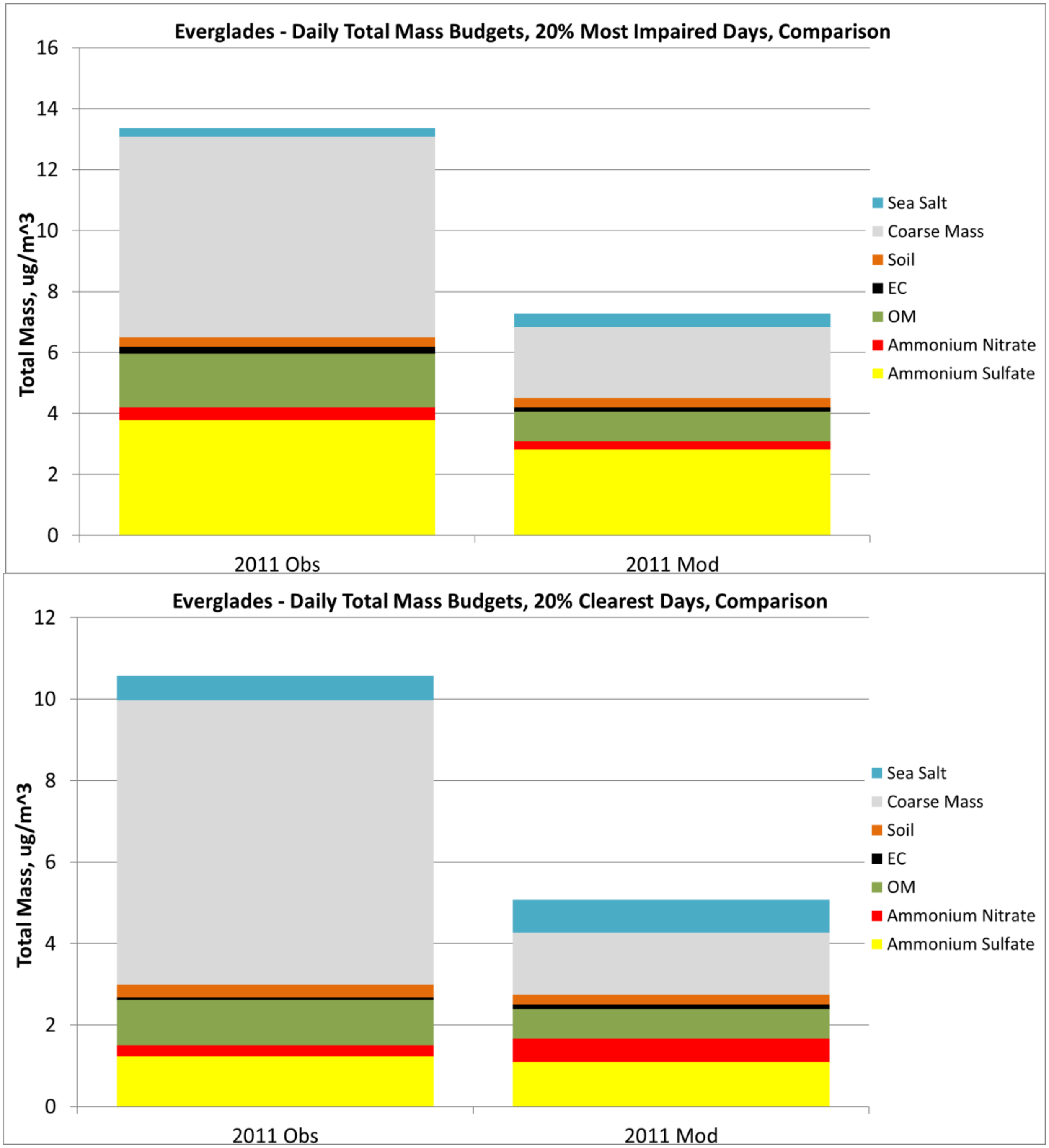
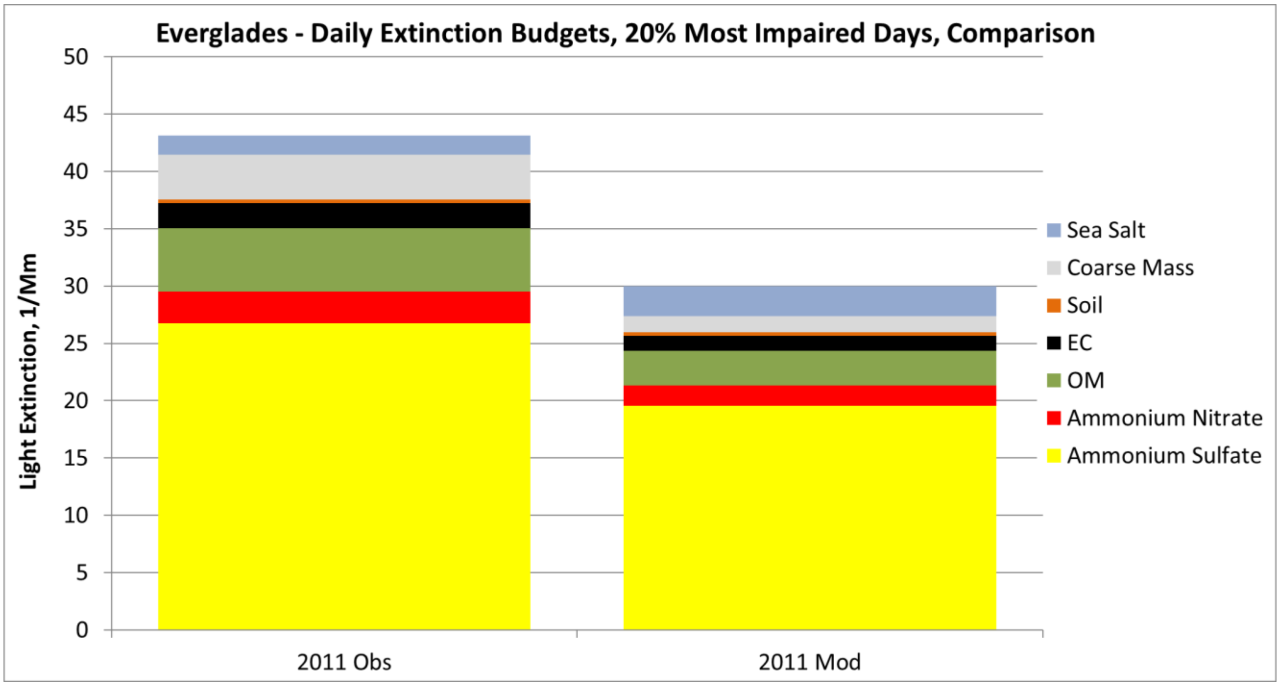


Figure 6-21: Stacked Bar Charts for Average $PM_{2.5}$ Concentrations on the 20% Most Impaired Days (top) and 20% Clearest Days (bottom) at Everglades



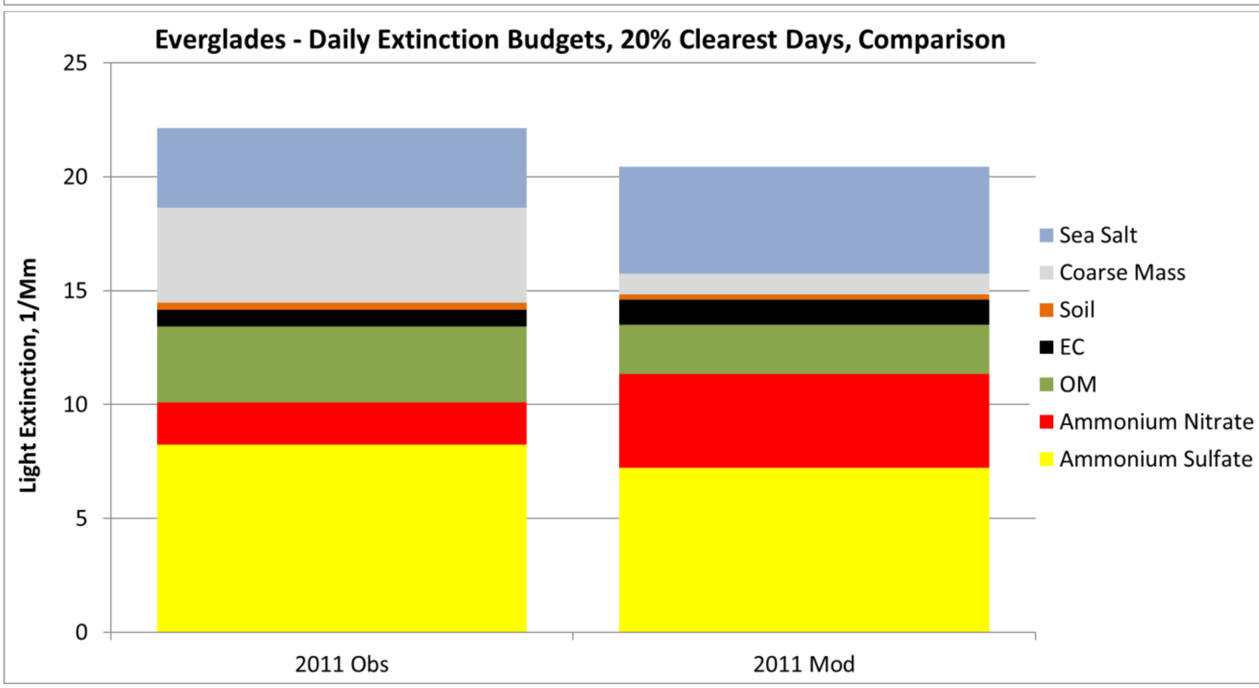


Figure 6-22: Stacked Bar Charts for Average Light Extinction on the 20% Most Impaired Days (top) and 20% Clearest Days (bottom) at Everglades

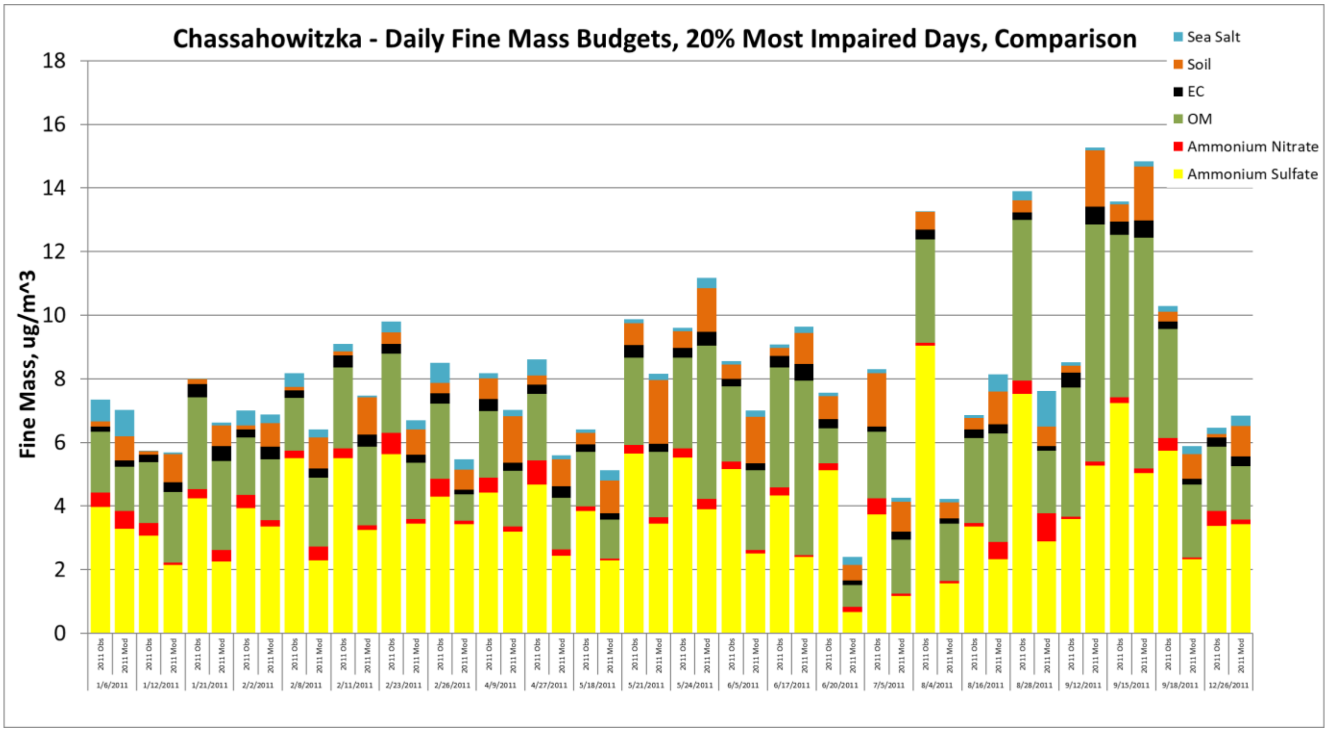


Figure 6-23: Stacked Bar Charts for Daily $PM_{2.5}$ Concentrations at Chassahowitzka on the 20% Most Impaired Days: Observation (left) and Modeled (Right)

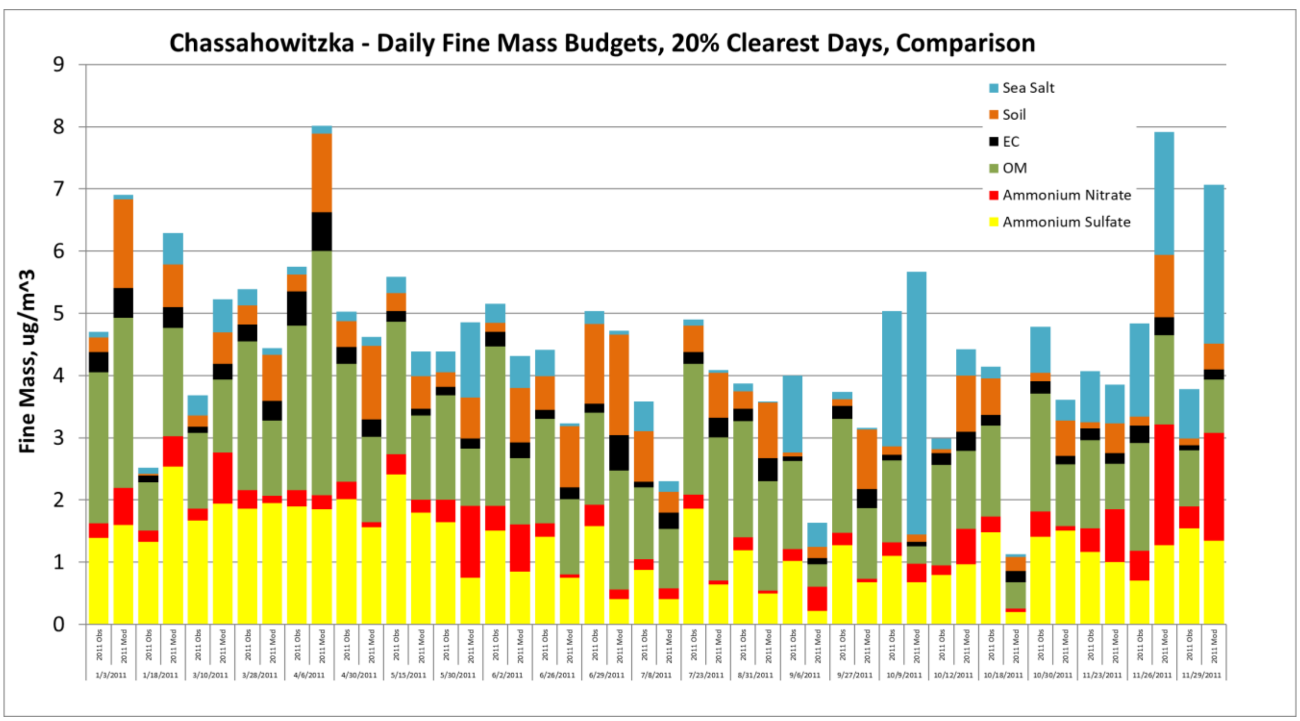


Figure 6-24: Stacked Bar Charts for Daily $PM_{2.5}$ Concentrations at Chassahowitzka on the 20% Clearest Days: Observation (left) and Modeled (Right)

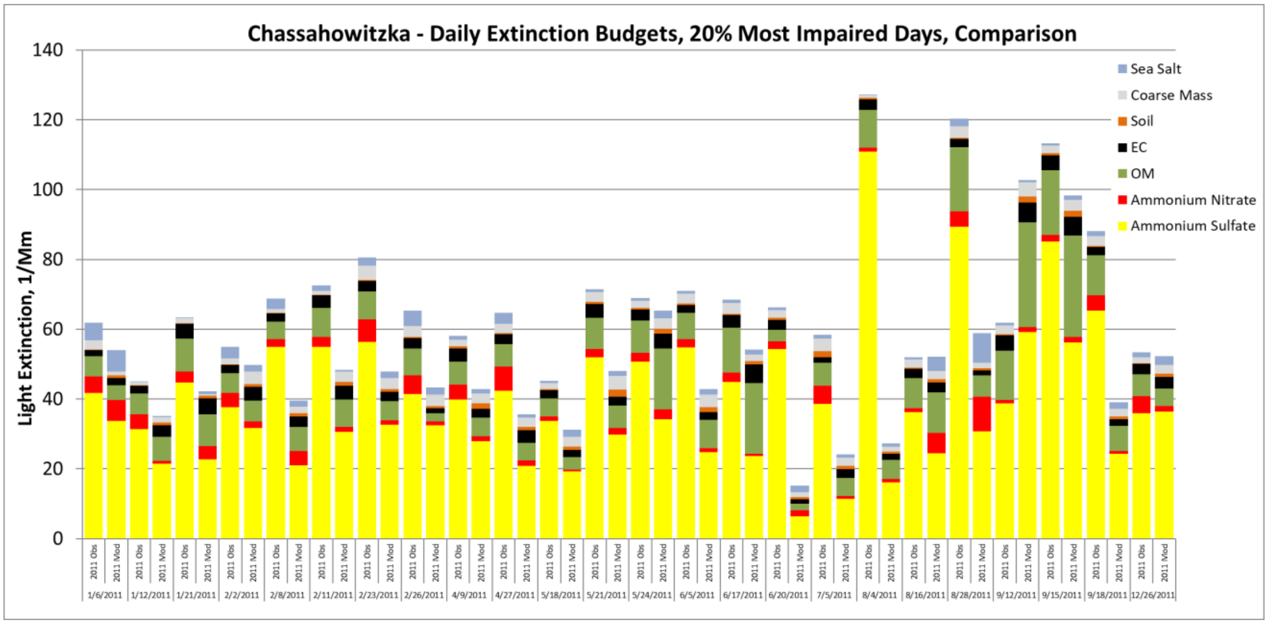


Figure 6-25: Stacked Bar Charts for Light Extinction at Chassahowitzka on the 20% Most-Impaired Days: Observation (left) and Modeled (Right)

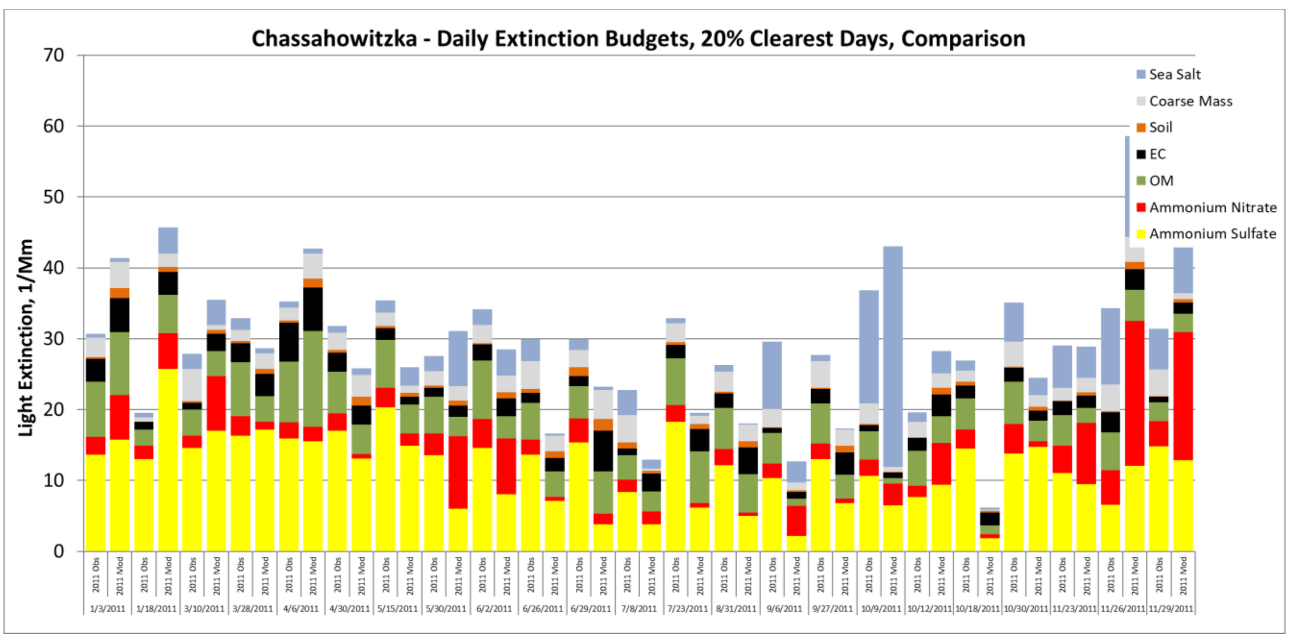


Figure 6-26: Stacked Bar Charts for Light Extinction at Chassahowitzka on the 20% Clearest Days: Observation (left) and Modeled (Right)

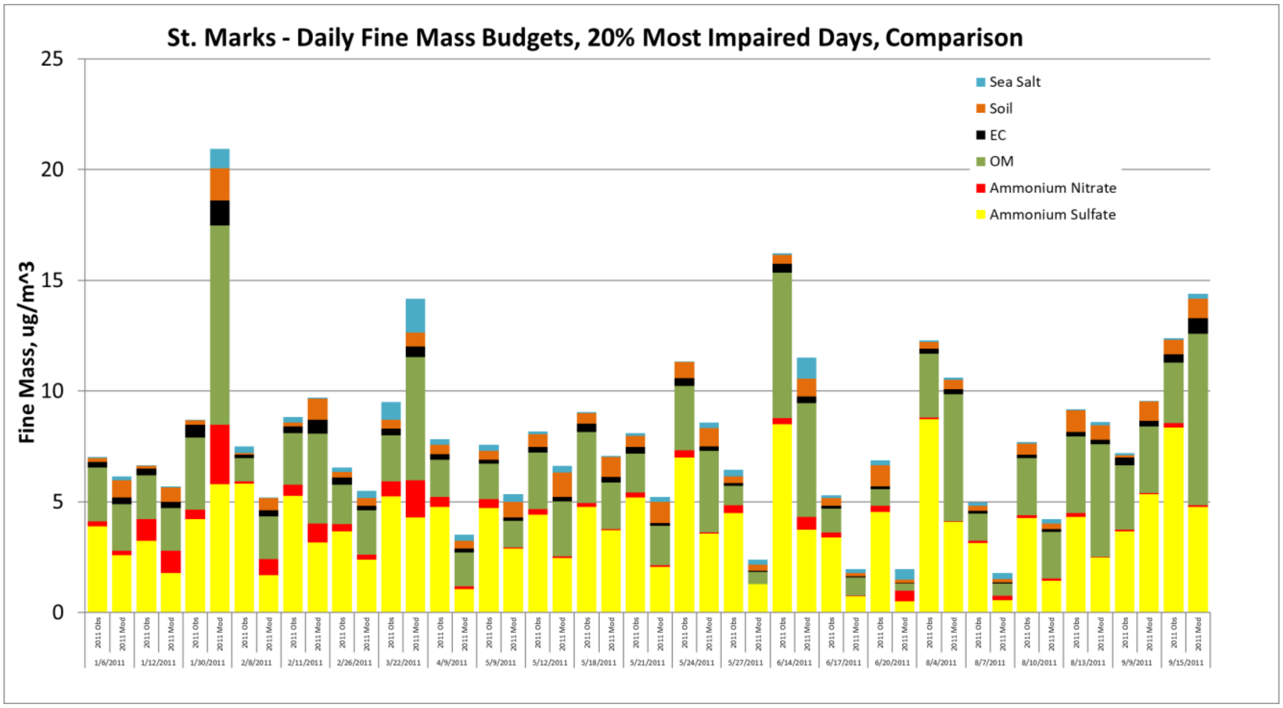


Figure 6-27: Stacked Bar Charts for Daily $PM_{2.5}$ Concentrations at St. Marks on the 20% Most-Impaired Days: Observation (left) and Modeled (Right)

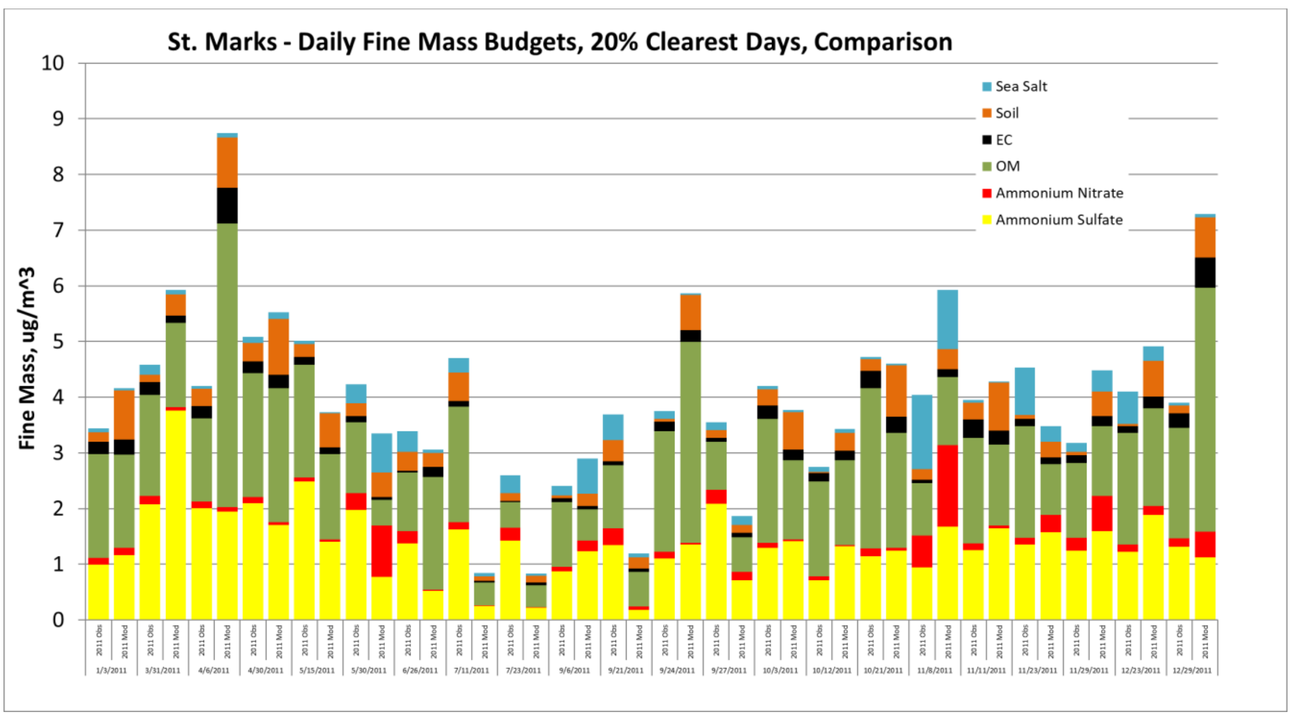


Figure 6-28: Stacked Bar Charts for Daily $PM_{2.5}$ Concentrations at St. Marks on the 20% Clearest Days: Observation (left) and Modeled (Right)

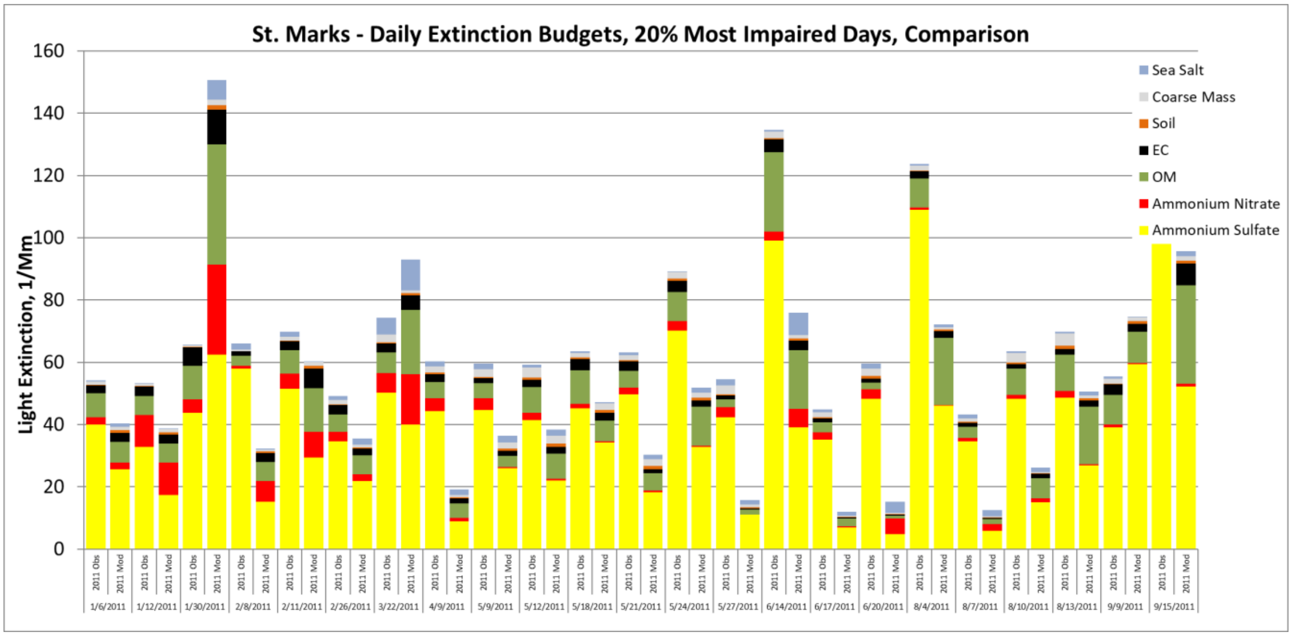


Figure 6-29: Stacked Bar Charts for Light Extinction at St. Marks on the 20% Most-Impaired Days: Observation (left) and Modeled (Right)

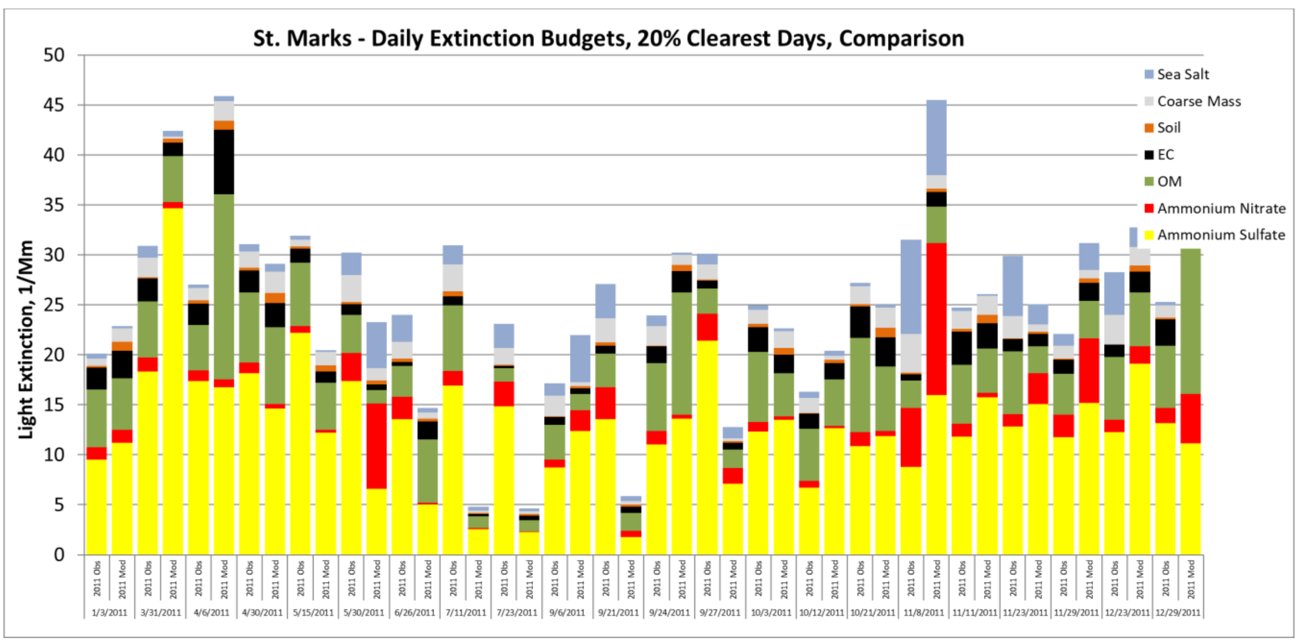


Figure 6-30: Stacked Bar Charts for Light Extinction at St. Marks on the 20% Clearest Days: Observation (left) and Modeled (Right)

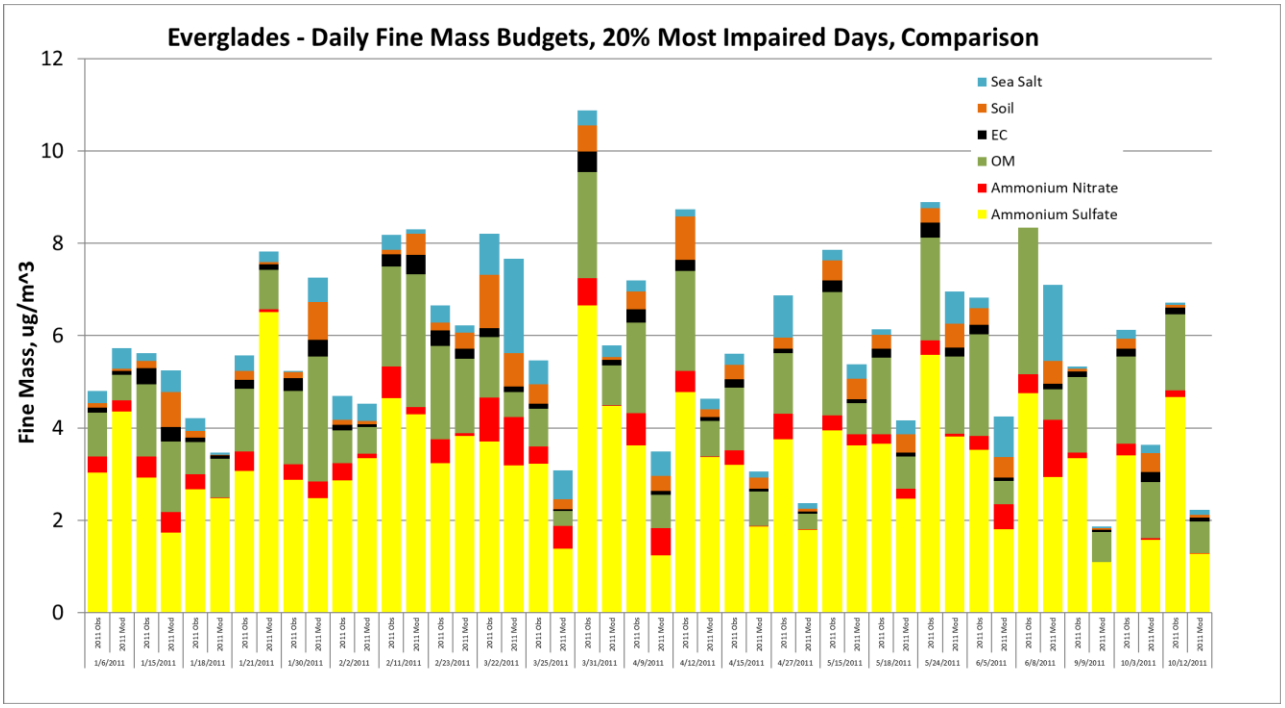


Figure 6-31: Stacked Bar Charts for Daily $PM_{2.5}$ Concentrations at Everglades on the 20% Most-Impaired Days: Observation (left) and Modeled (Right)

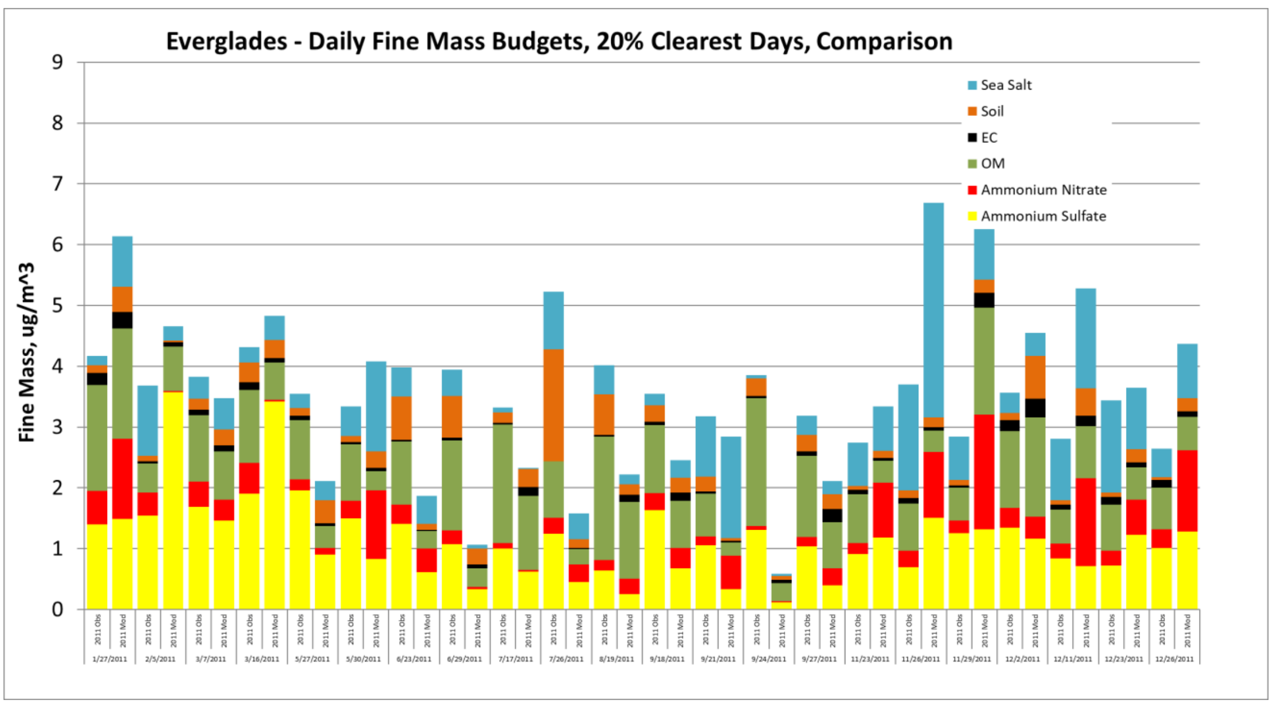


Figure 6-32: Stacked Bar Charts for Daily $PM_{2.5}$ Concentrations at Everglades on the 20% Clearest Days: Observation (left) and Modeled (Right)

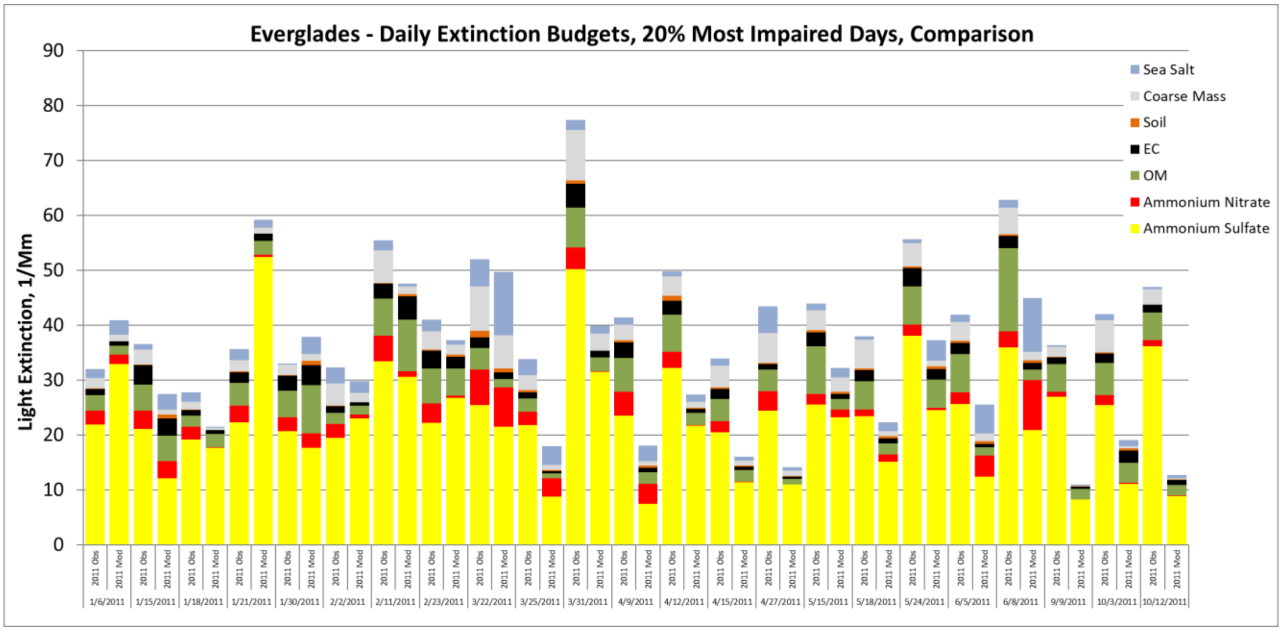


Figure 6-33: Stacked Bar Charts for Light Extinction at Everglades on the 20% Most-Impaired Days: Observation (left) and Modeled (Right)

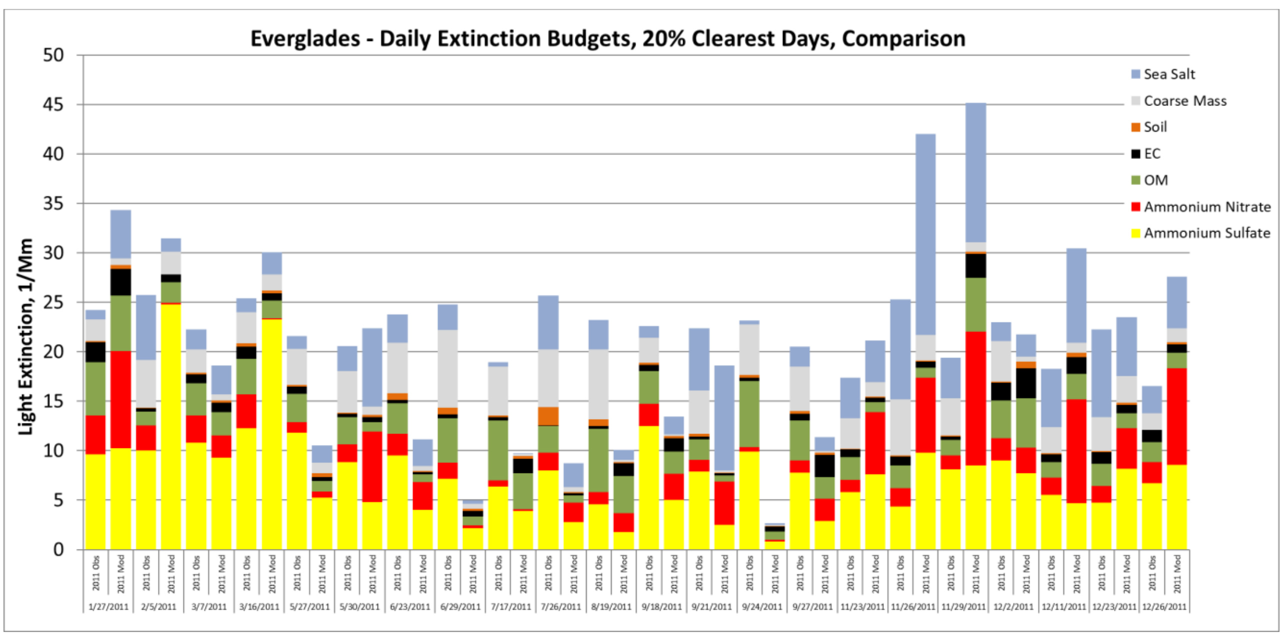


Figure 6-34: Stacked Bar Charts for Light Extinction at Everglades on the 20% Clearest Days: Observation (left) and Modeled (Right)

Figure 6-35 and Figure 6-36 contain scatter plots of daily observations vs. modeled concentration for $PM_{2.5}$, sulfate, nitrate, organic carbon, elemental carbon, crustal (labeled as soil), sea salt, and coarse mass for Chassahowitzka on the 20% most-impaired days. $PM_{2.5}$, sulfate, and nitrate were generally under predicted while crustal was generally over predicted. Organic carbon, elemental carbon, sea salt, and coarse mass (labeled as PMC) show both over predictions and under predictions.

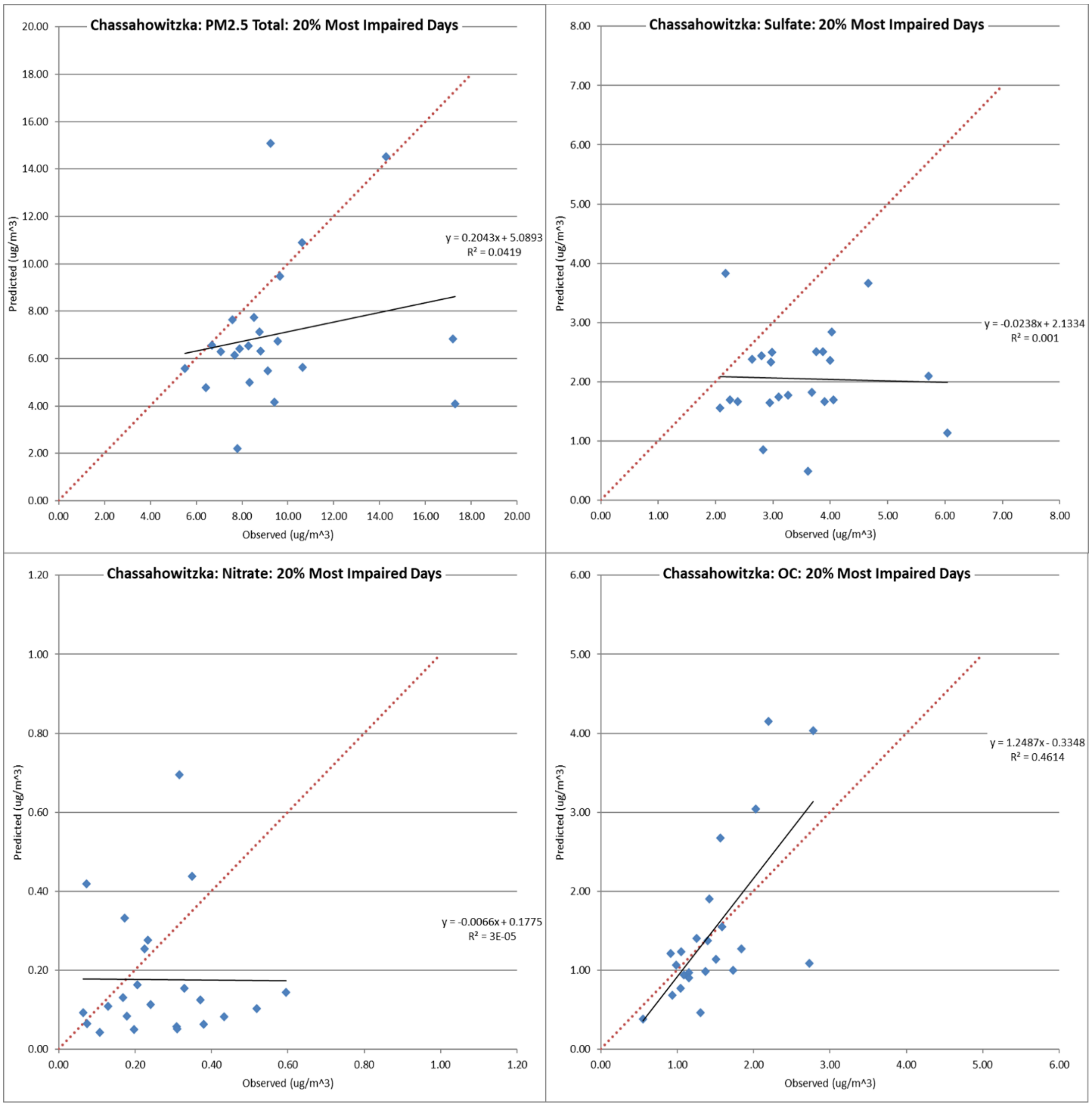


Figure 6-35: Scatter Plot for Daily $PM_{2.5}$ (top left), Sulfate (top right), Nitrate (bottom left), and Organic Carbon (bottom right) Concentrations at Chassahowitzka on the 20% Most Impaired Days

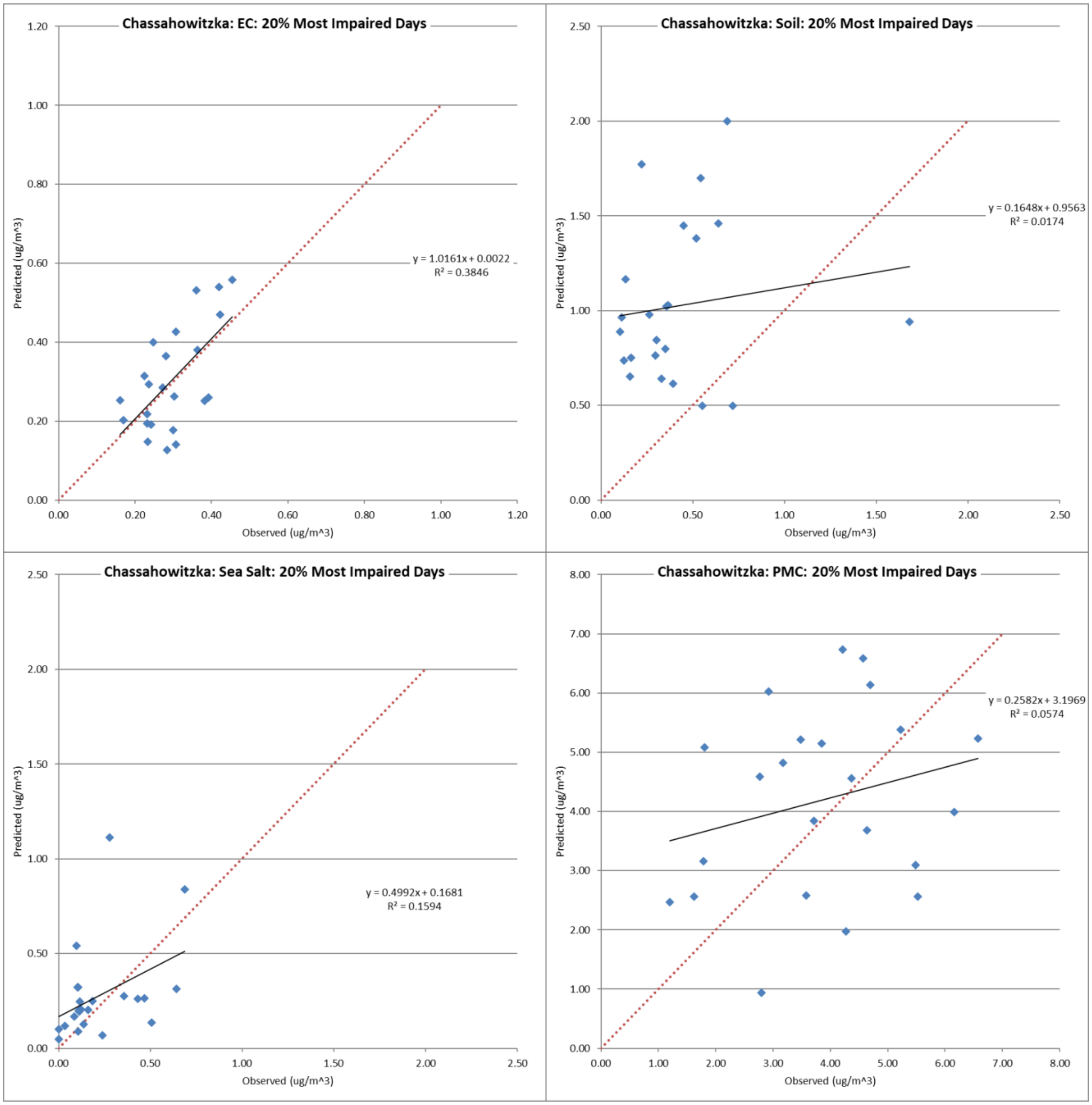


Figure 6-36: Scatter Plot for Daily Elemental Carbon (top left), Crustal (top right), Sea Salt (bottom left), and Coarse Mass (bottom right, labeled as PMC) Concentrations at Chassahowitzka on the 20% Most Impaired Days

Figure 6-37 and Figure 6-38 contain scatter plots of daily observations vs. modeled concentration for $PM_{2.5}$, sulfate, nitrate, organic carbon, elemental carbon, crustal (labeled as soil), sea salt, and coarse mass (labeled as PMC) for Chassahowitzka on the 20% clearest days. Elemental carbon, crustal, and nitrate were generally over predicted. $PM_{2.5}$, sulfate, organic carbon, sea salt, and coarse mass show both over predictions and under predictions.

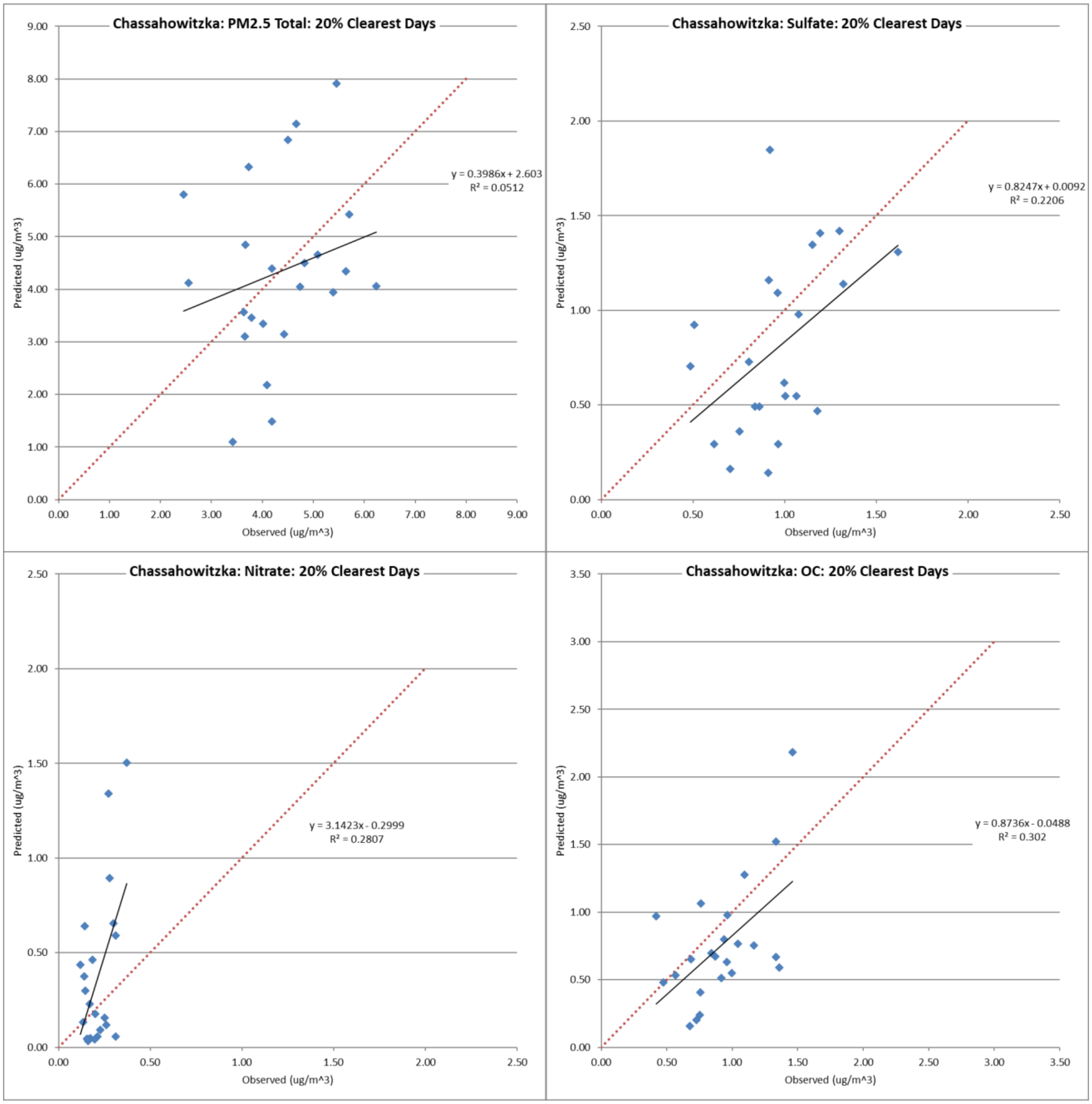


Figure 6-37: Scatter Plot for Daily $PM_{2.5}$ (top left), Sulfate (top right), Nitrate (bottom left), and Organic Carbon (bottom right) Concentrations at Chassahowitzka on the 20% Clearest Days.

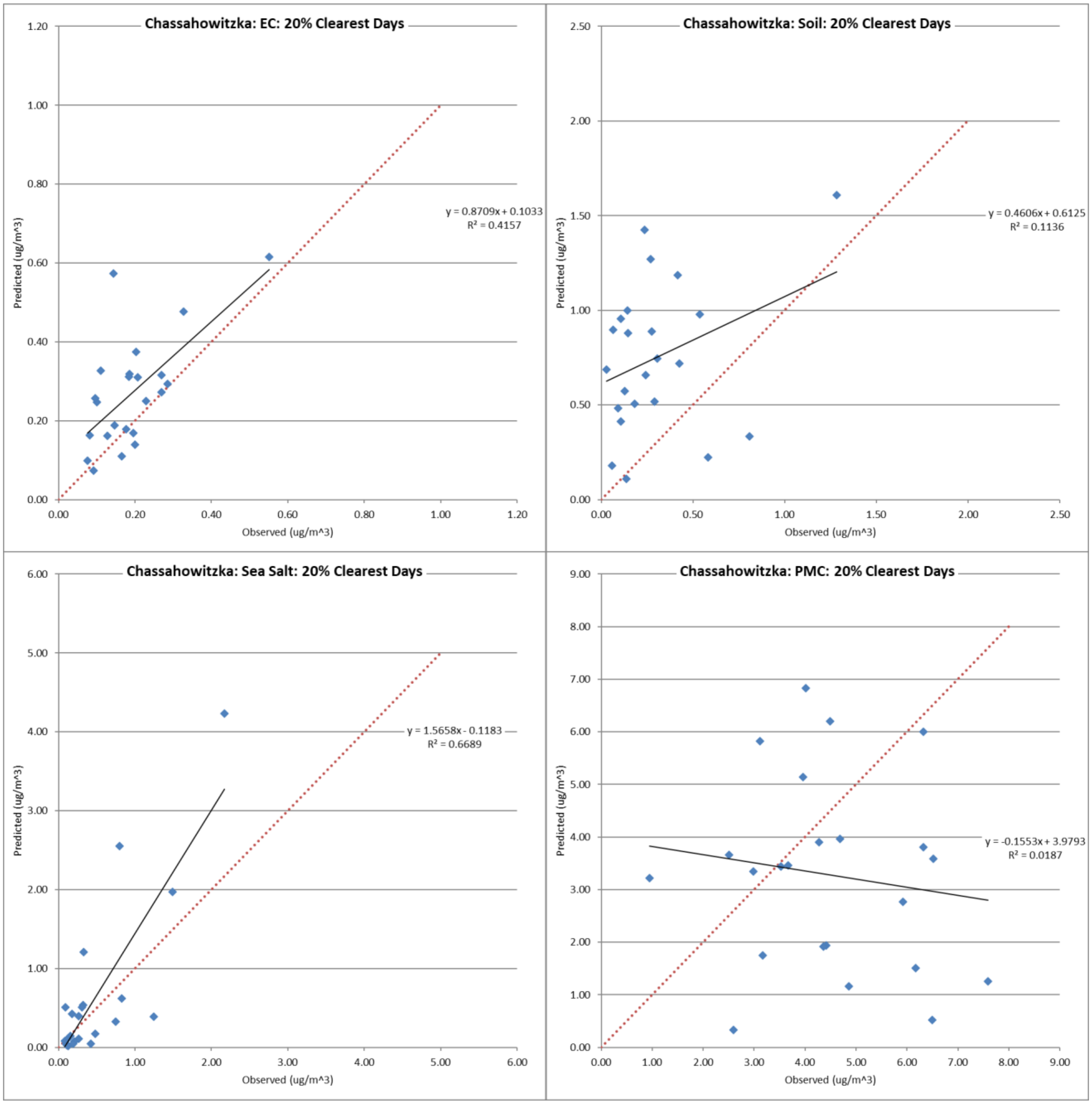


Figure 6-38: Scatter Plot for Daily Elemental Carbon (top left), Crustal (top right), Sea Salt (bottom left), and Coarse Mass (bottom right, labeled as PMC) Concentrations at Chassahowitzka on the 20% Clearest Days

Figure 6-39 and Figure 6-40 contain scatter plots of daily observations vs. modeled concentration for $PM_{2.5}$, sulfate, nitrate, organic carbon, elemental carbon, crustal (labeled as soil), sea salt, and coarse mass (labeled as PMC) for St. Marks on the 20% most impaired days. $PM_{2.5}$, sulfate, and coarse mass were generally under predicted while organic carbon, soil and sea salt were generally over predicted. Nitrate and elemental carbon show both over predictions and under predictions.

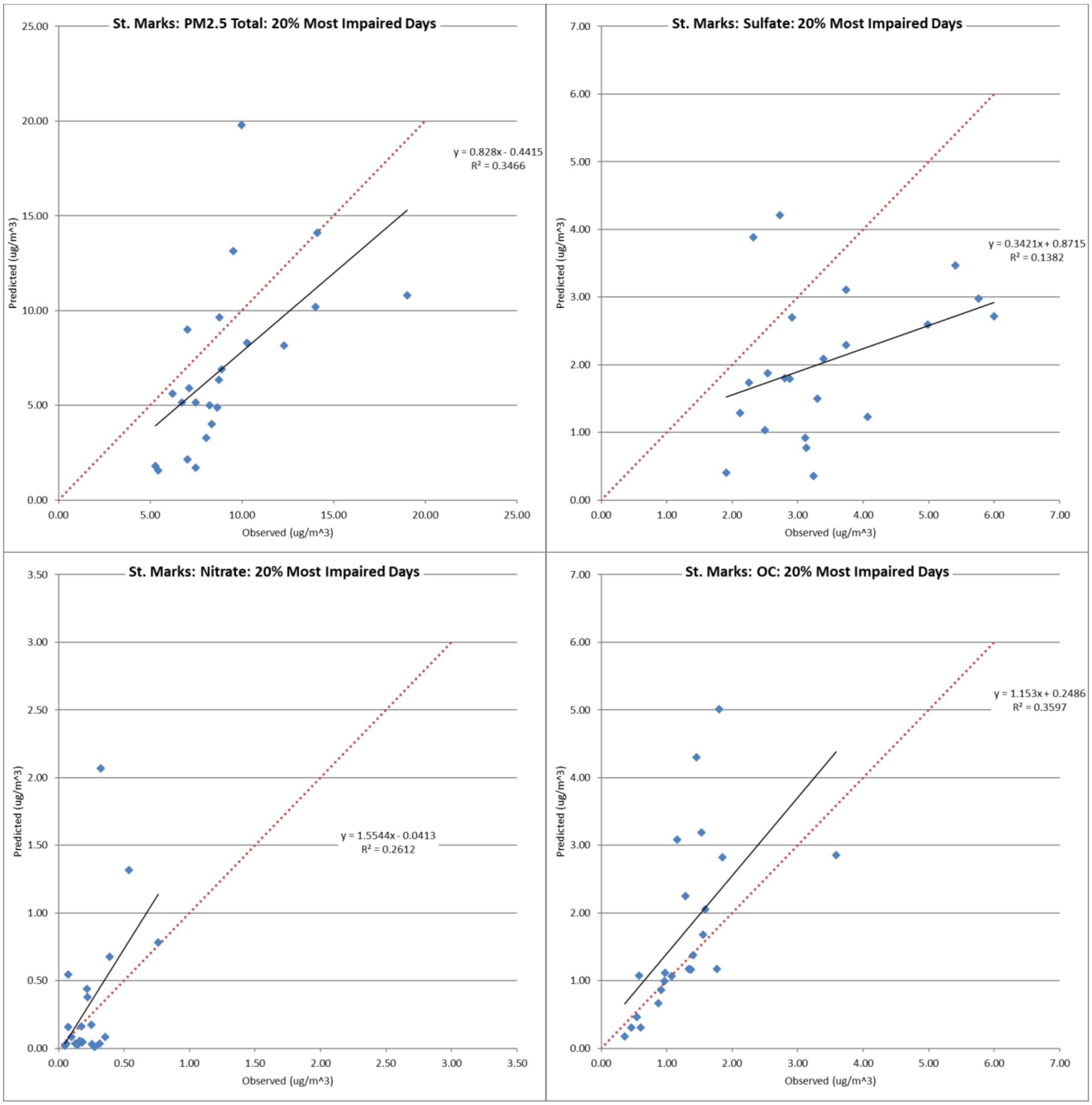


Figure 6-39: Scatter Plot for Daily $PM_{2.5}$ (top left), Sulfate (top right), Nitrate (bottom left), and Organic Carbon (bottom right) Concentrations at St. Marks on the 20% Most Impaired Days

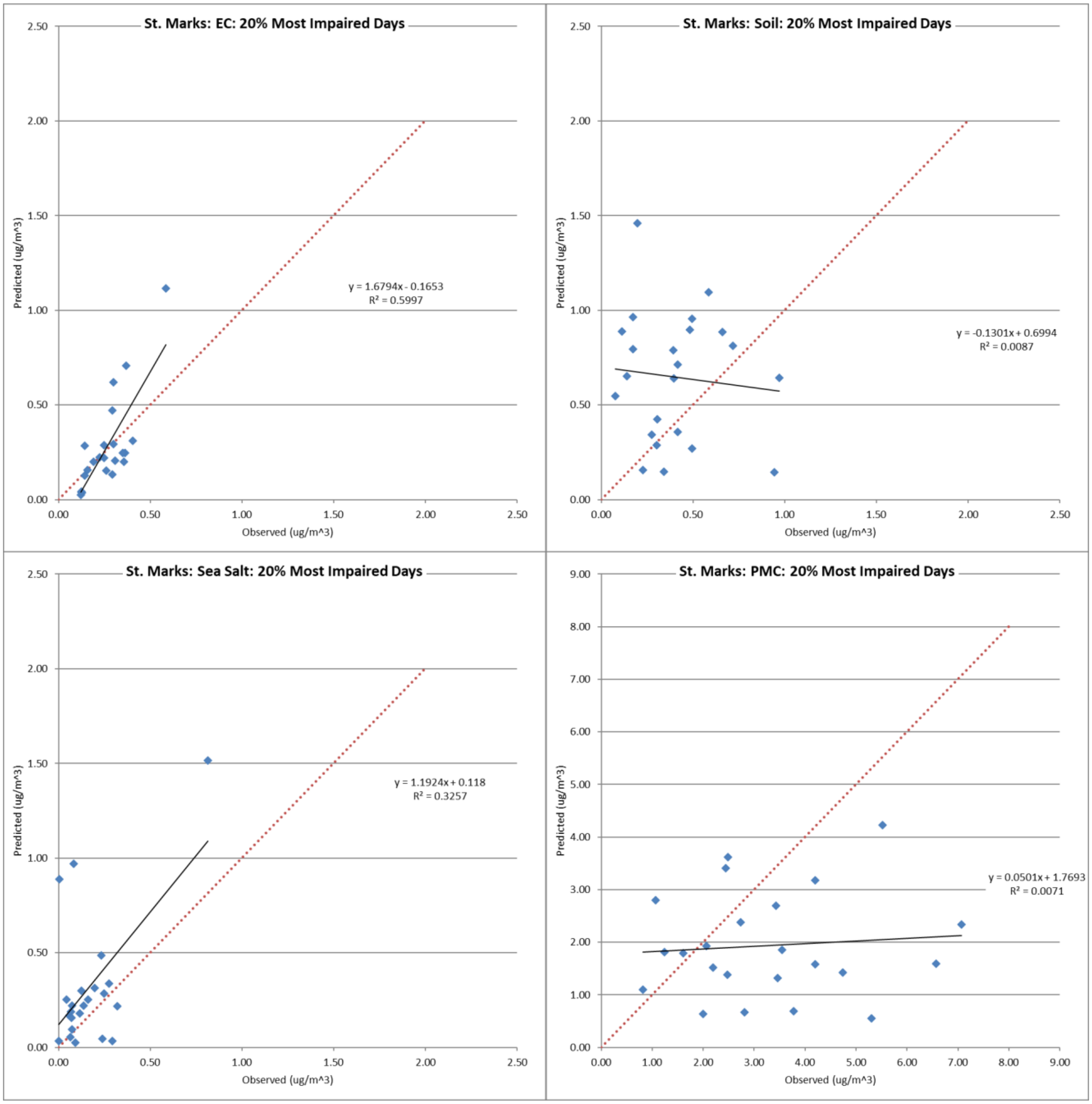


Figure 6-40: Scatter Plot for Daily Elemental Carbon (top left), Crustal (top right), Sea Salt (bottom left), and Coarse Mass (bottom right) Concentrations at St. Marks on the 20% Most Impaired Day

Figure 6-41 and Figure 6-42 contain scatter plots of daily observations vs. modeled concentration for $PM_{2.5}$, sulfate, nitrate, organic carbon, elemental carbon, crustal (labeled as soil), sea salt, and coarse mass for St. Marks on the 20% clearest days. Coarse mass (labeled as PMC) was generally under predicted while crustal was generally over predicted. $PM_{2.5}$, sulfate, nitrate, organic carbon, elemental carbon, and sea salt show both over predictions and under predictions.

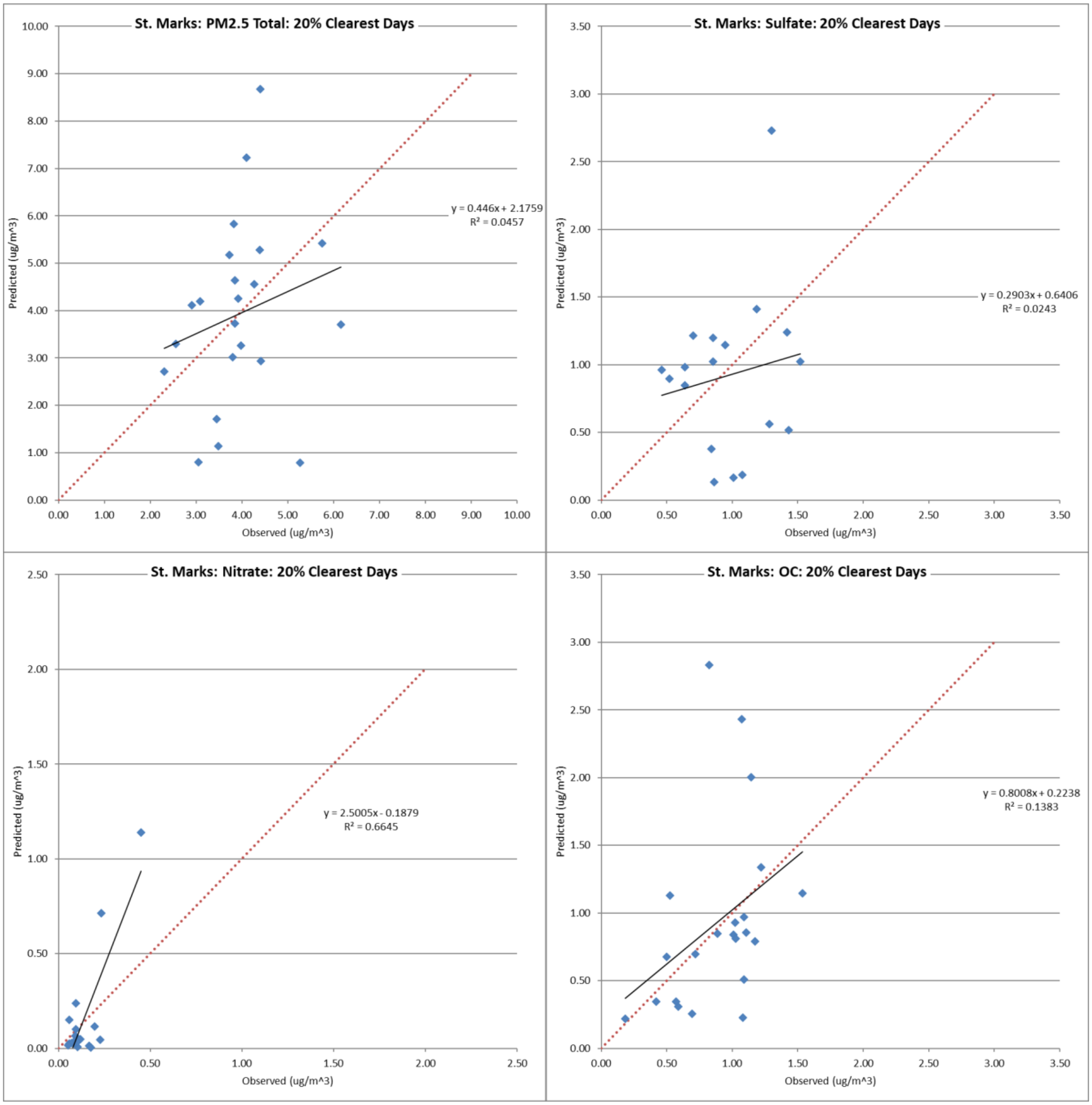


Figure 6-41: Scatter Plot for Daily $PM_{2.5}$ (top left), Sulfate (top right), Nitrate (bottom left), and Organic Carbon (bottom right) Concentrations at St. Marks on the 20% Clearest Days

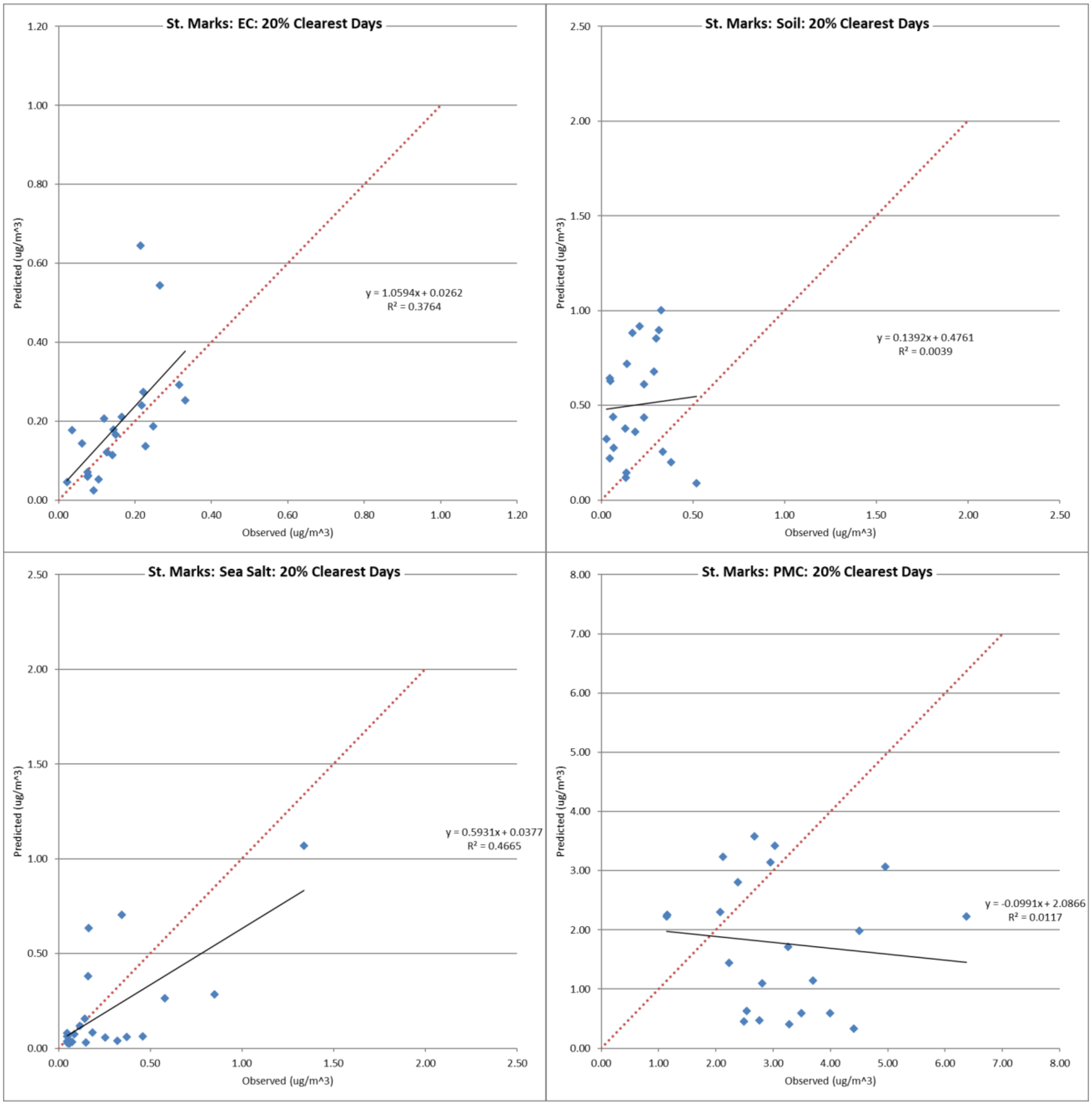


Figure 6-42: Scatter Plot for Daily Elemental Carbon (top left), Crustal (top right), Sea Salt (bottom left), and Coarse Mass (bottom right, labeled as PMC) Concentrations at St. Marks on the 20% Clearest Days

Figure 6-43 and Figure 6-44 contain scatter plots of daily observations vs. modeled concentration for $PM_{2.5}$, sulfate, nitrate, organic carbon, elemental carbon, crustal (labeled as soil), sea salt, and coarse mass for Everglades on the 20% most impaired days. $PM_{2.5}$, nitrate, organic carbon, elemental carbon, and coarse mass (PMC) were generally under predicted. Sulfate, crustal, and sea salt show both over predictions and under predictions.

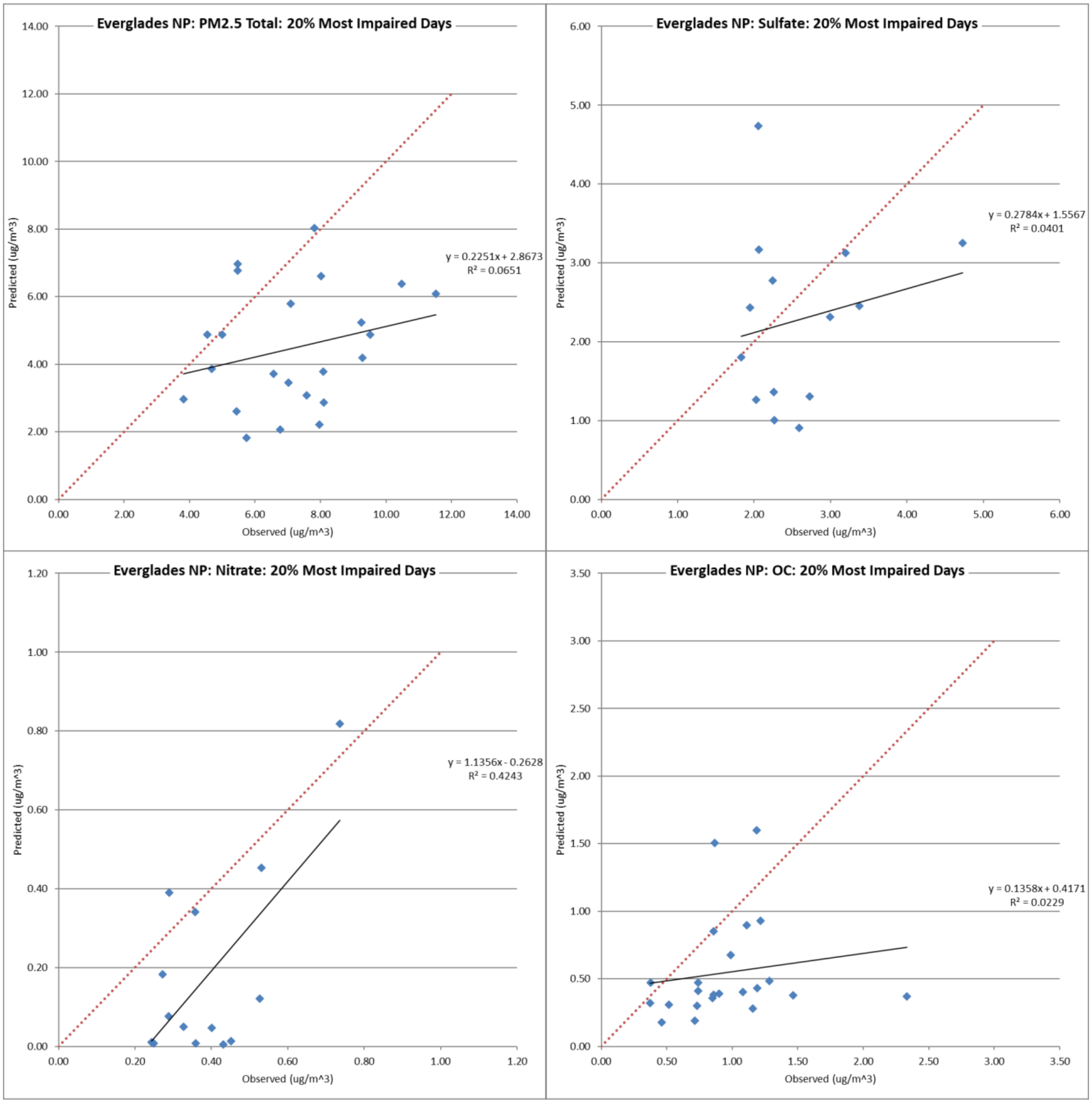


Figure 6-43: Scatter Plot for Daily $PM_{2.5}$ (top left), Sulfate (top right), Nitrate (bottom left), and Organic Carbon (bottom right) Concentrations at Everglades on the 20% Most Impaired Days

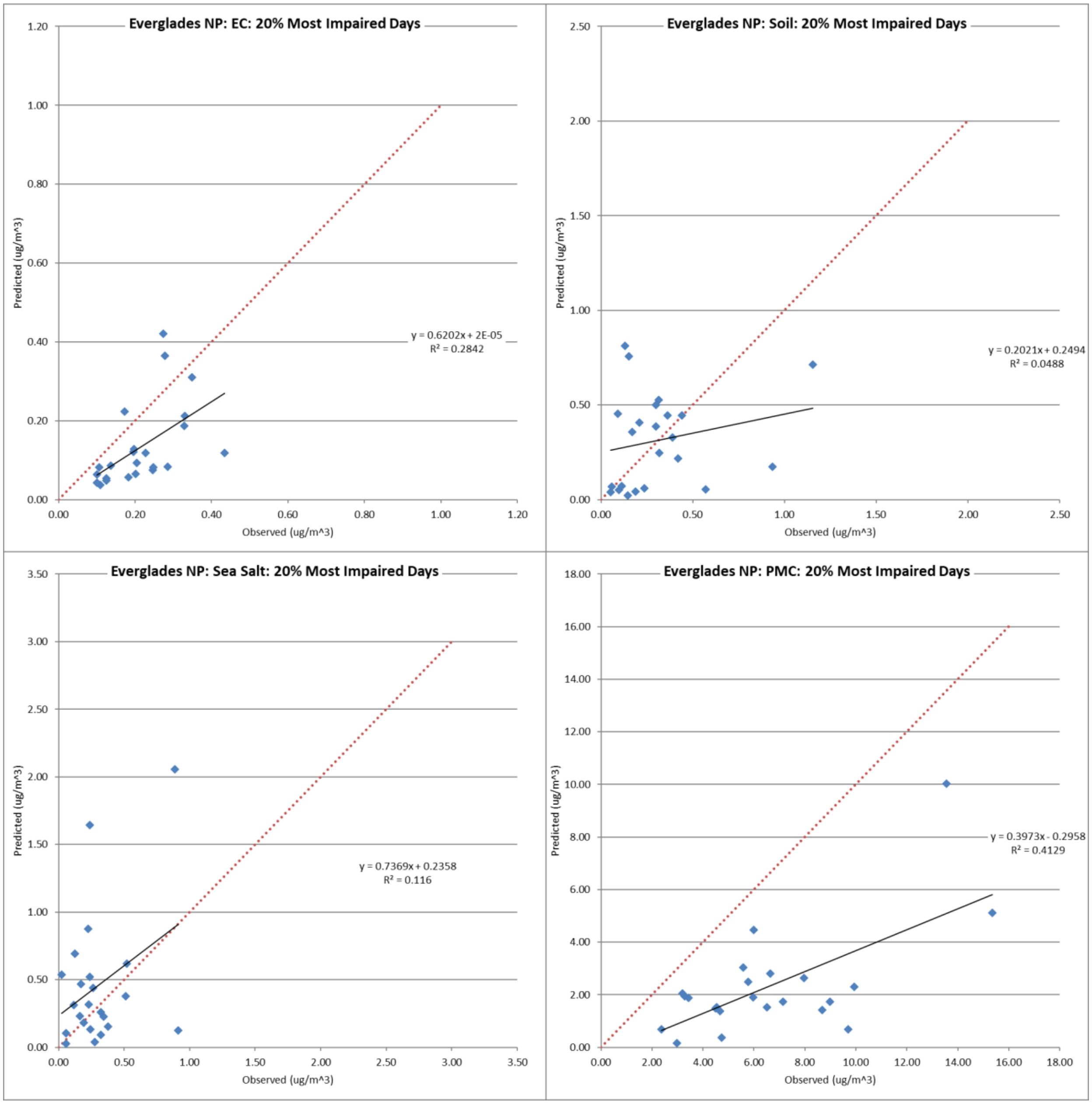


Figure 6-44: Scatter Plot for Daily Elemental Carbon (top left), Crustal (top right), Sea Salt (bottom left), and Coarse Mass (bottom right, labeled as PMC) Concentrations at Everglades on the 20% Most Impaired Days

Figure 6-45 and Figure 6-46 contain scatter plots of daily observations vs. modeled concentration for $PM_{2.5}$, sulfate, nitrate, organic carbon, elemental carbon, crustal (labeled as soil), sea salt, and coarse mass for Everglades on the 20% clearest days. Coarse mass (PMC) was generally under predicted while sulfate and elemental carbon were generally over predicted. $PM_{2.5}$, nitrate, organic carbon, crustal, and sea salt show both over predictions and under predictions. $PM_{2.5}$, crustal and coarse mass show generally poor prediction.

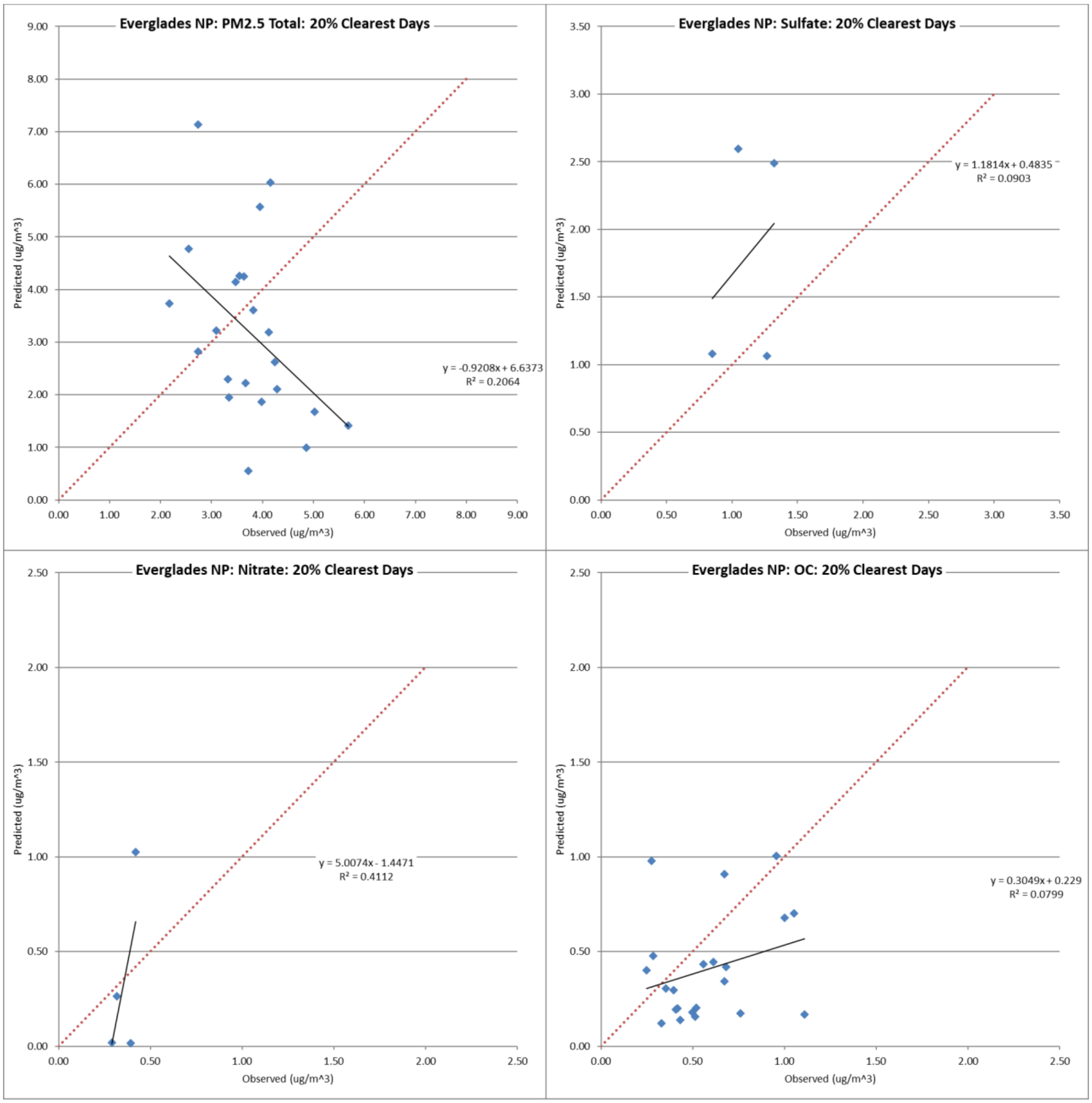


Figure 6-45: Scatter Plot for Daily $PM_{2.5}$ (top left), Sulfate (top right), Nitrate (bottom left), and Organic Carbon (bottom right) Concentrations at Everglades on the 20% Clearest Days

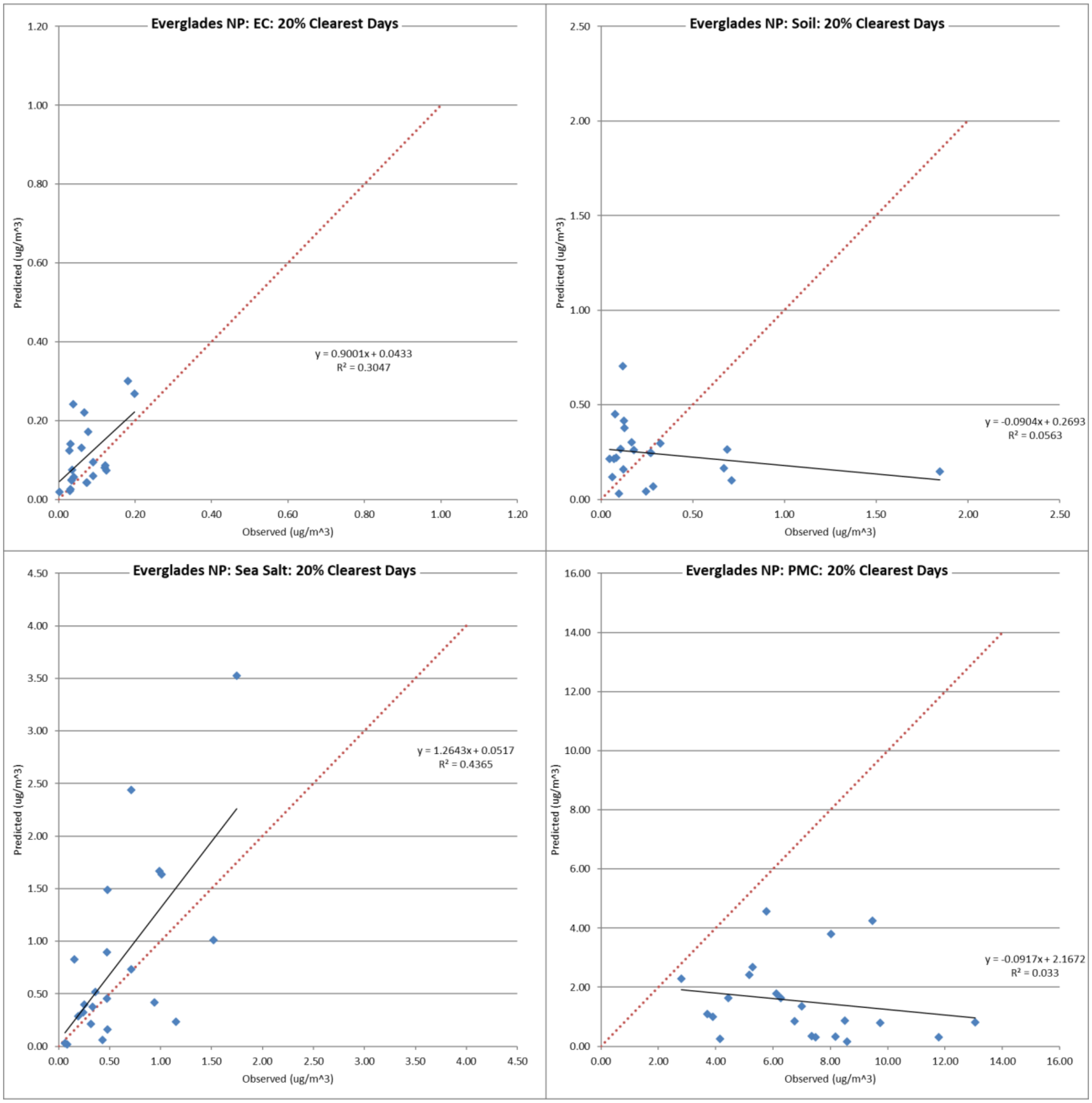


Figure 6-46: Scatter Plot for Daily Elemental Carbon (top left), Crustal (top right), Sea Salt (bottom left), and Coarse Mass (bottom right, labeled as PMC) Concentrations at Everglades on the 20% Clearest Days

Figure 6-47 through Figure 6-52 are soccer plots showing NMB and NME for modeled sulfate, nitrate, organic carbon, elemental carbon, crustal, and coarse mass for Chassahowitzka, St. Marks, and Everglades on the 20% most impaired days and the 20% clearest days. For Chassahowitzka on the 20% most impaired days, sulfate, nitrate, organic carbon, elemental carbon, and coarse mass meet the NMB and NME criteria while crustal does not. For Chassahowitzka on the 20% clearest days, sulfate, elemental carbon, organic carbon, and coarse mass meet the NMB and NME criteria while nitrate and crustal do not. For St. Marks on the 20% most impaired days, sulfate, nitrate, organic carbon, elemental carbon, coarse mass, and crustal all meet the NMB and NME criteria. For St. Marks on the 20% clearest days, sulfate, nitrate, organic carbon, elemental carbon, and coarse mass meet the NMB and NME criteria while crustal does not. For Everglades on the 20% most impaired days, sulfate, nitrate, organic carbon, elemental carbon, coarse mass, and crustal all meet the NMB and NME criteria. For Everglades on the 20% clearest days, sulfate, nitrate, organic carbon, elemental carbon, and crustal meet the NMB and NME criteria while coarse mass does not.

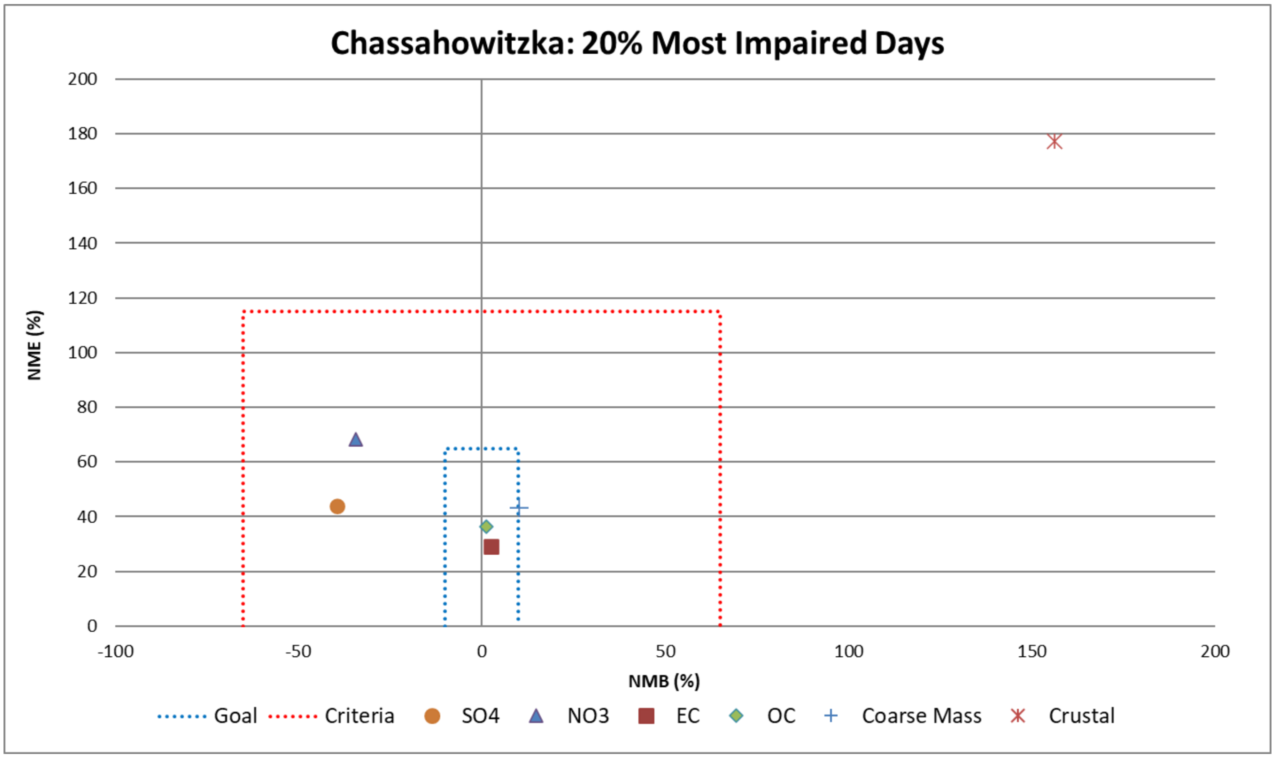


Figure 6-47: Soccer Plot for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Most Impaired Days at Chassahowitzka

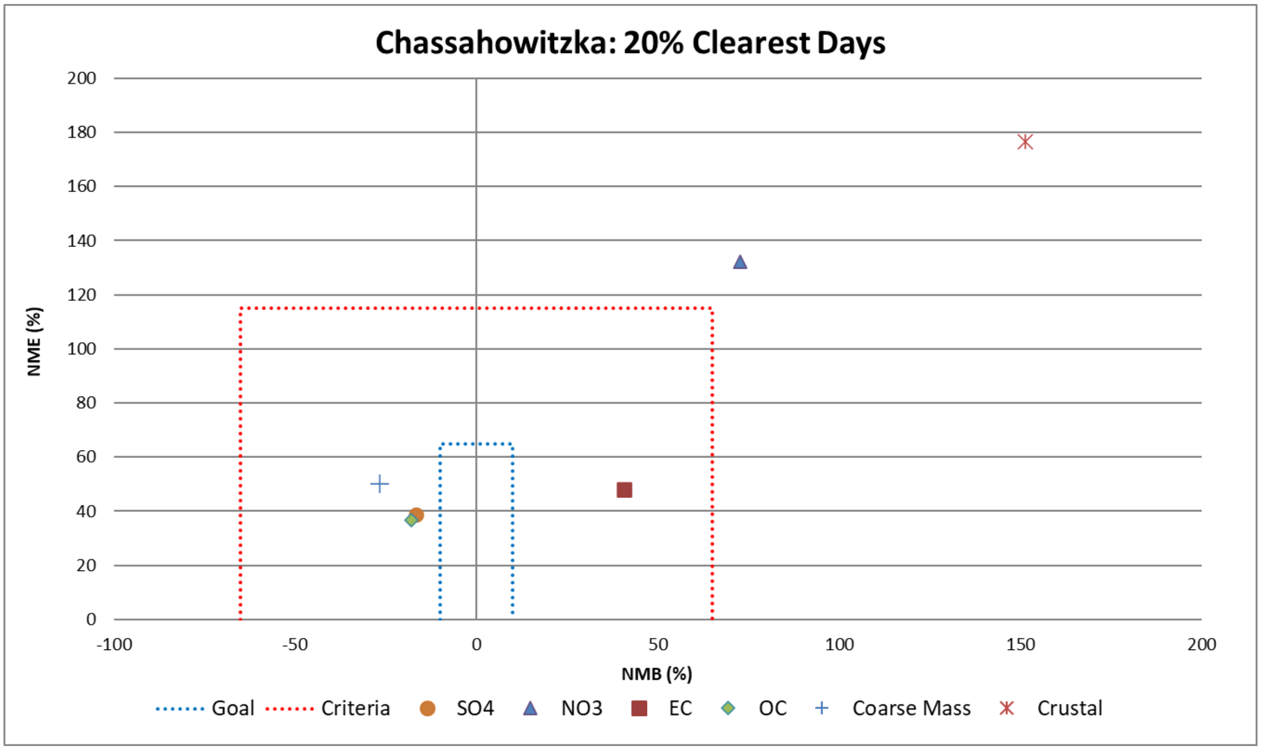


Figure 6-48: Soccer Plot for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Clearest Days at Chassahowitzka

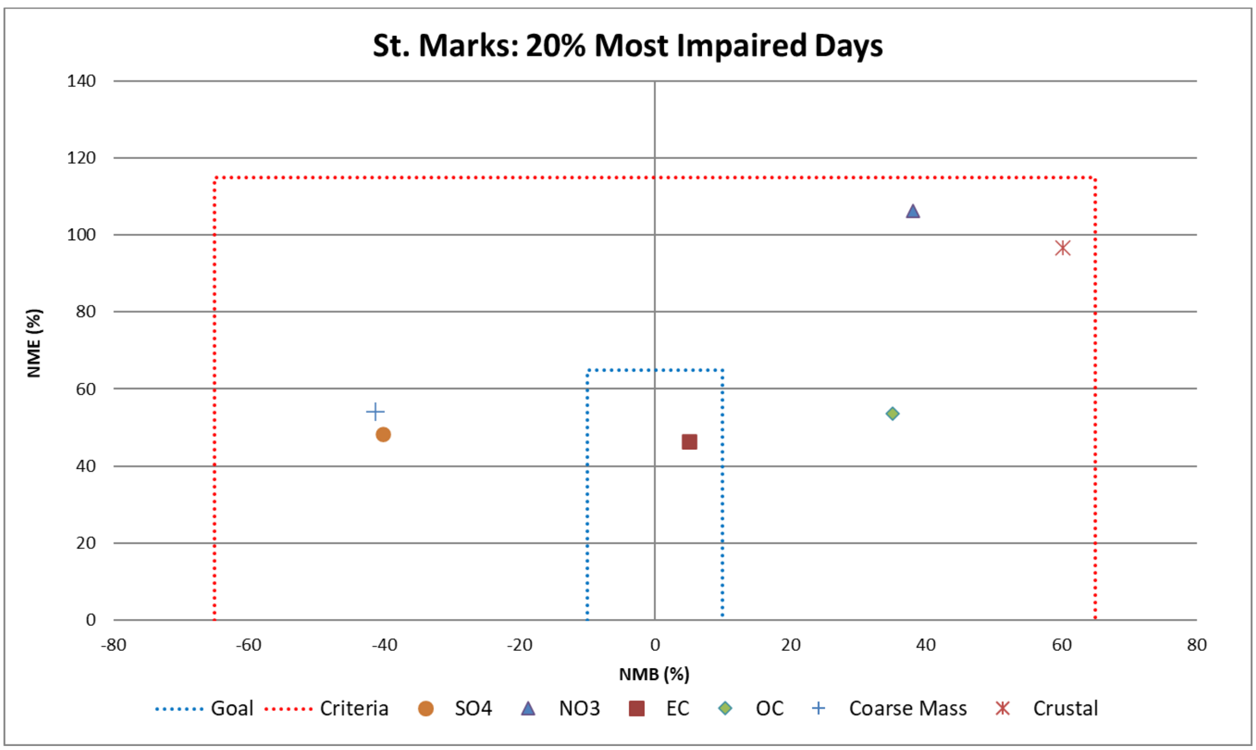


Figure 6-49: Soccer Plot for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Most Impaired Days at St. Marks

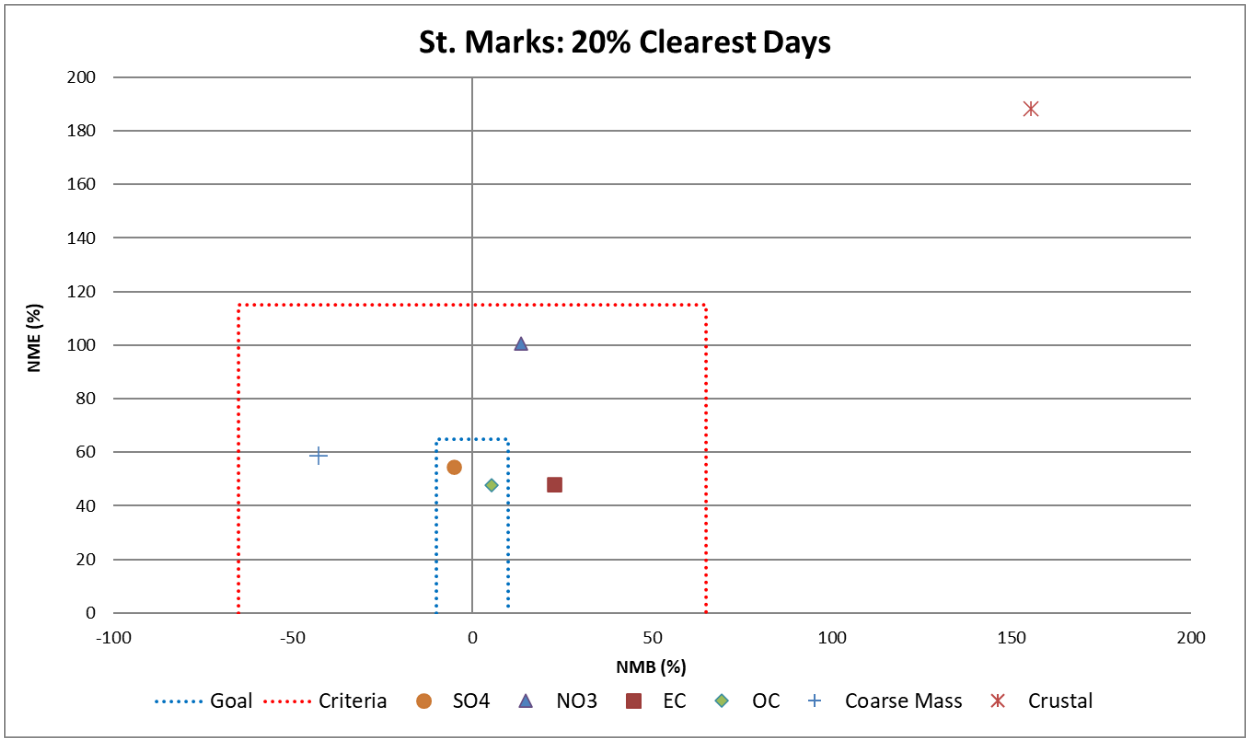


Figure 6-50: Soccer Plot for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Clearest Days at St. Marks

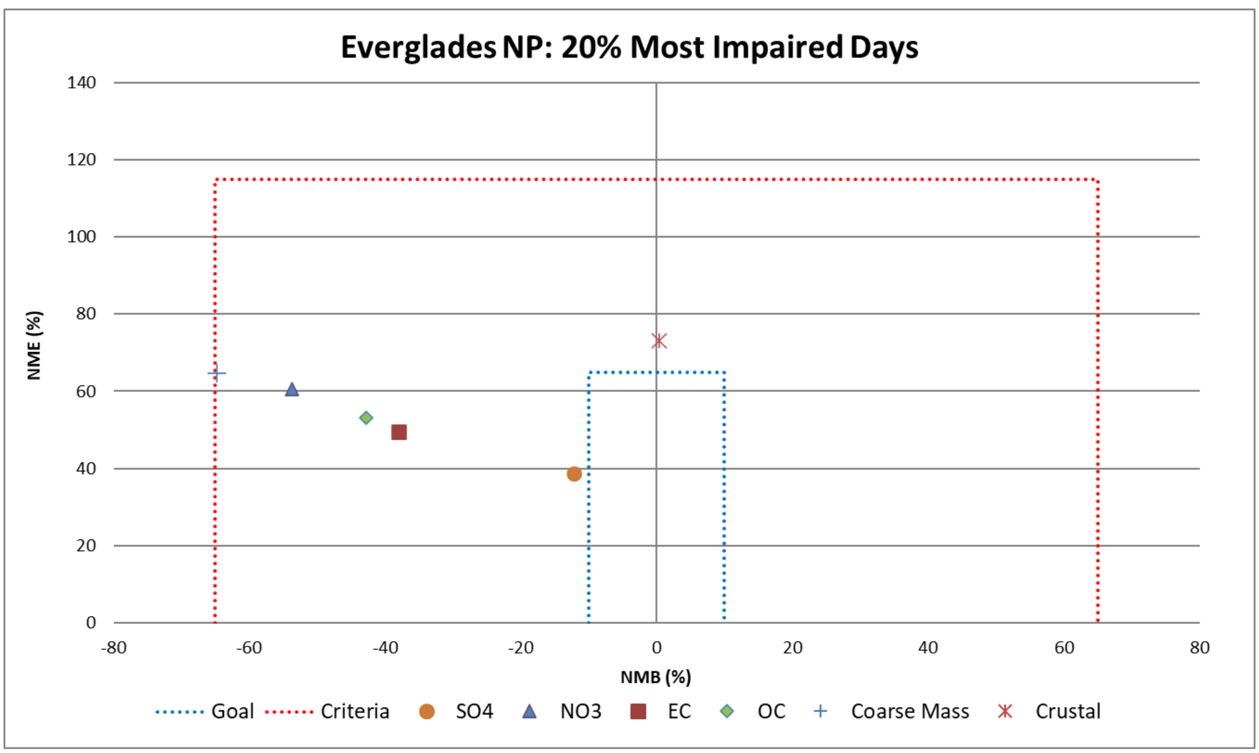


Figure 6-51: Soccer Plot for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Most Impaired Days at Everglades

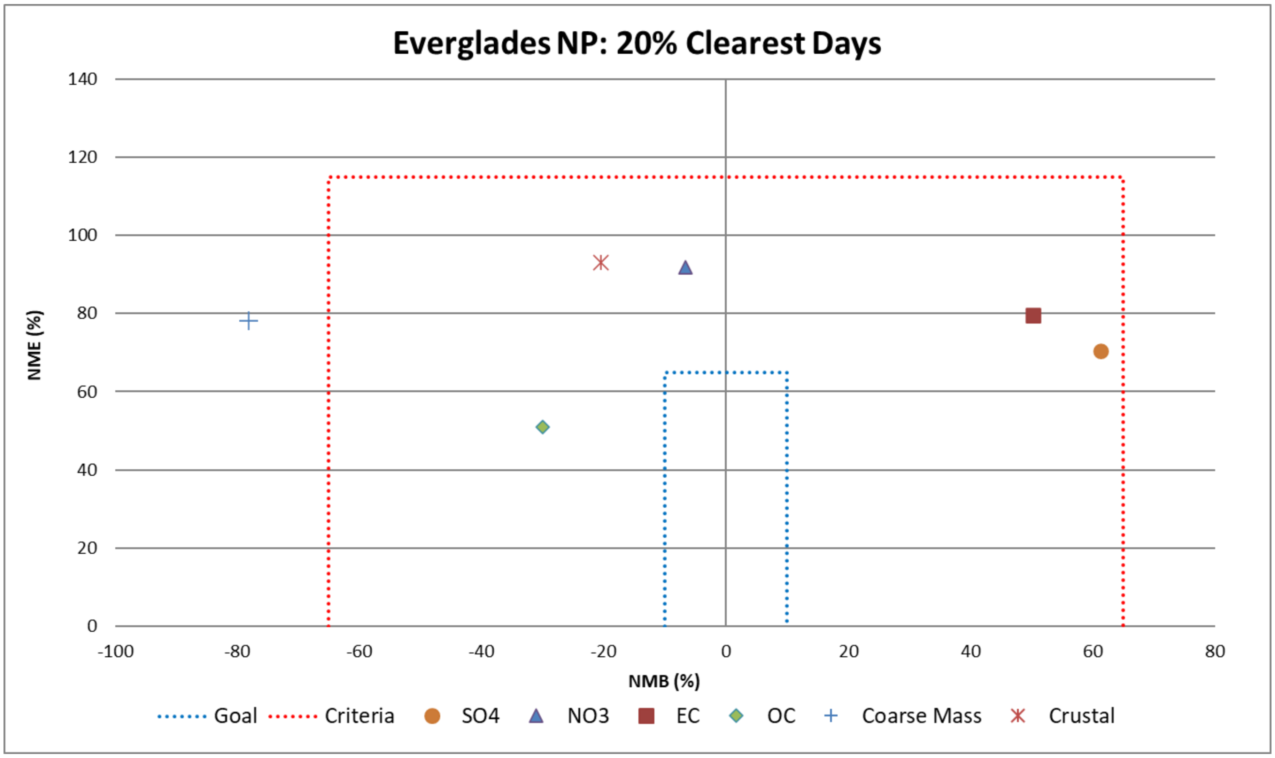


Figure 6-52: Soccer Plot for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Clearest Days at Everglades

Figure 6-53 and Figure 6-54 are bugle plots showing MFB and MFE for modeled sulfate, nitrate, organic carbon, elemental carbon, crustal, and coarse mass for Chassahowitzka on the 20% most impaired days and the 20% clearest days. On the 20% most impaired days and the 20% clearest days, all species meet the MFB and MFE criteria (red line). On the 20% most impaired days, all species (except sulfate MFB on the 20% most impaired days, and coarse mass MFB and MFE on 20% clearest days) meet the MFB and MFE goal (green line).

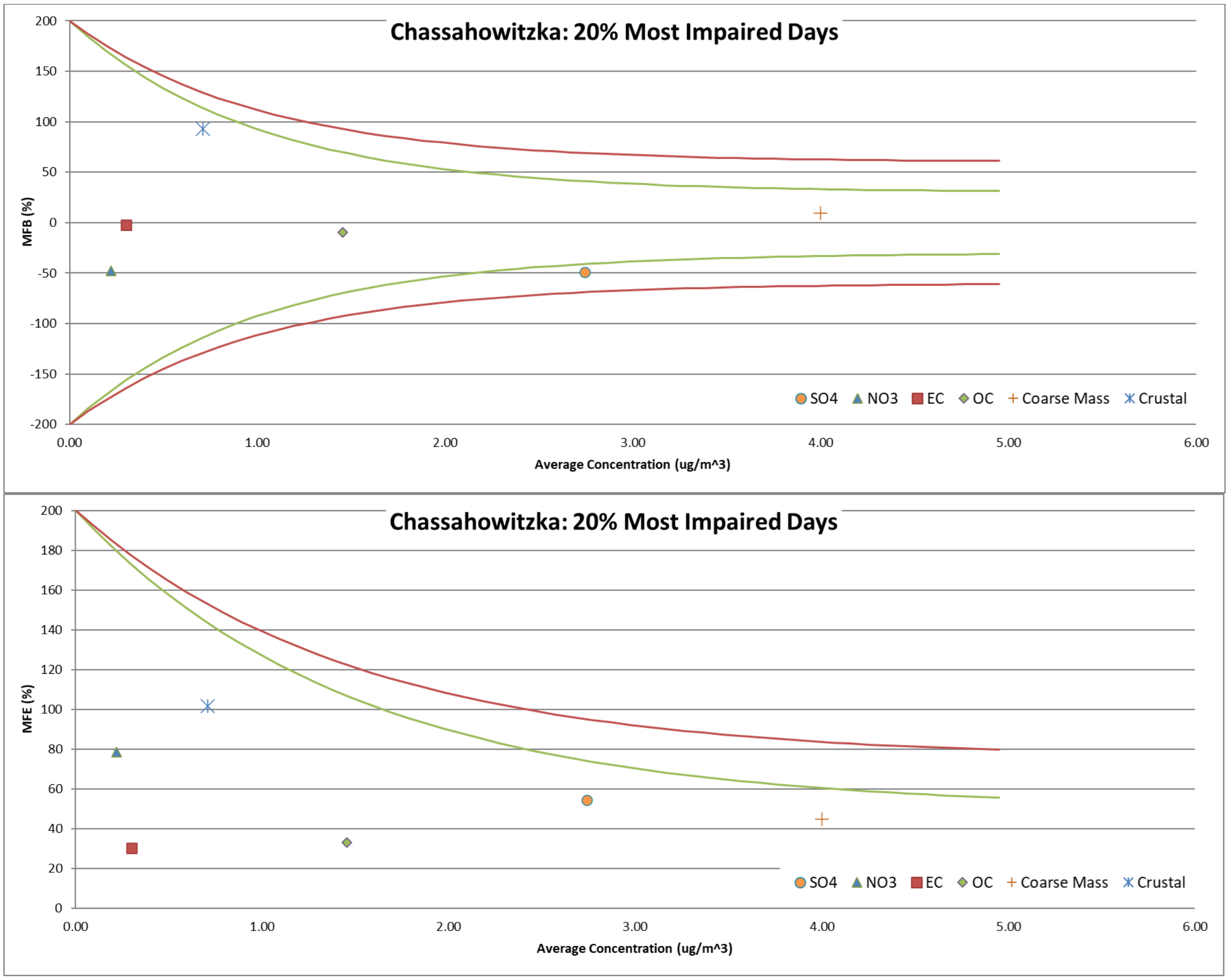
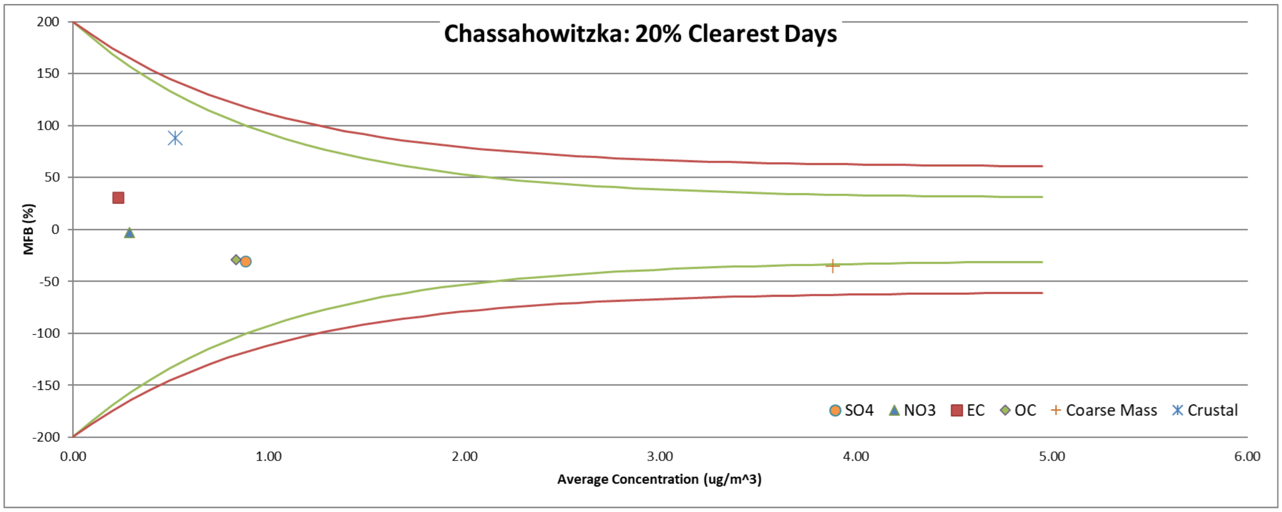


Figure 6-53: Bugle Plots of MFB (top) and MFE (bottom) for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Most Impaired Days at Chassahowitzka



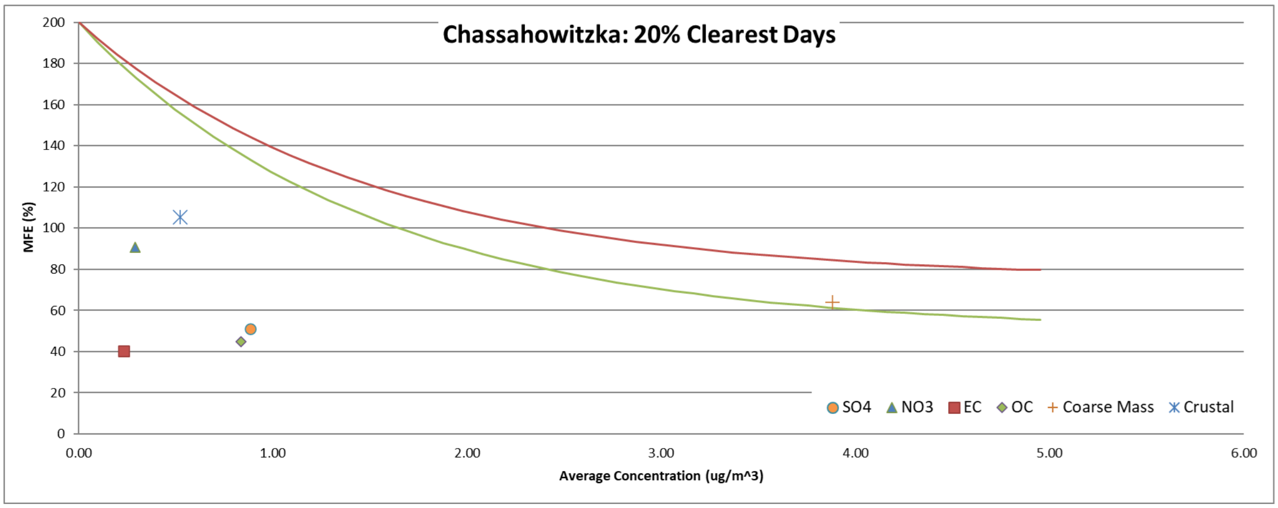


Figure 6-54: Bugle Plots of MFB (top) and MFE (bottom) for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Clearest Days at Chassahowitzka

Figure 6-55 and Figure 6-56 are bugle plots showing MFB and MFE for modeled sulfate, nitrate, organic carbon, elemental carbon, crustal, and coarse mass for St. Marks on the 20% most impaired days and the 20% clearest days. On the 20% most impaired days and the 20% clearest days, all species meet the MFB and MFE criteria (red line). On the 20% most impaired days, all species except coarse mass and sulfate MFB meet the MFB and MFE goal (green line). On the 20% clearest days, all species except coarse mass meet the MFB and MFE goal (green line).

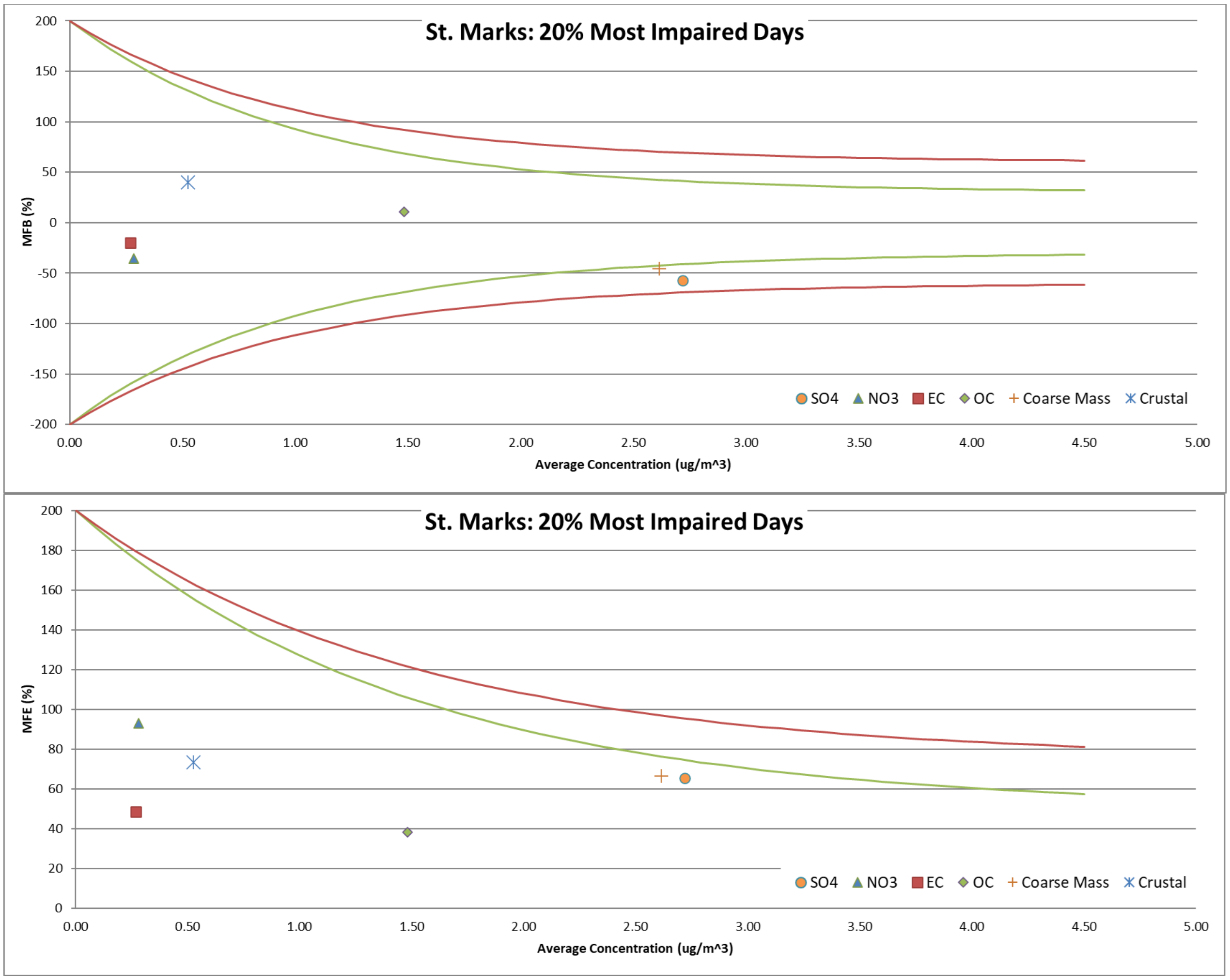
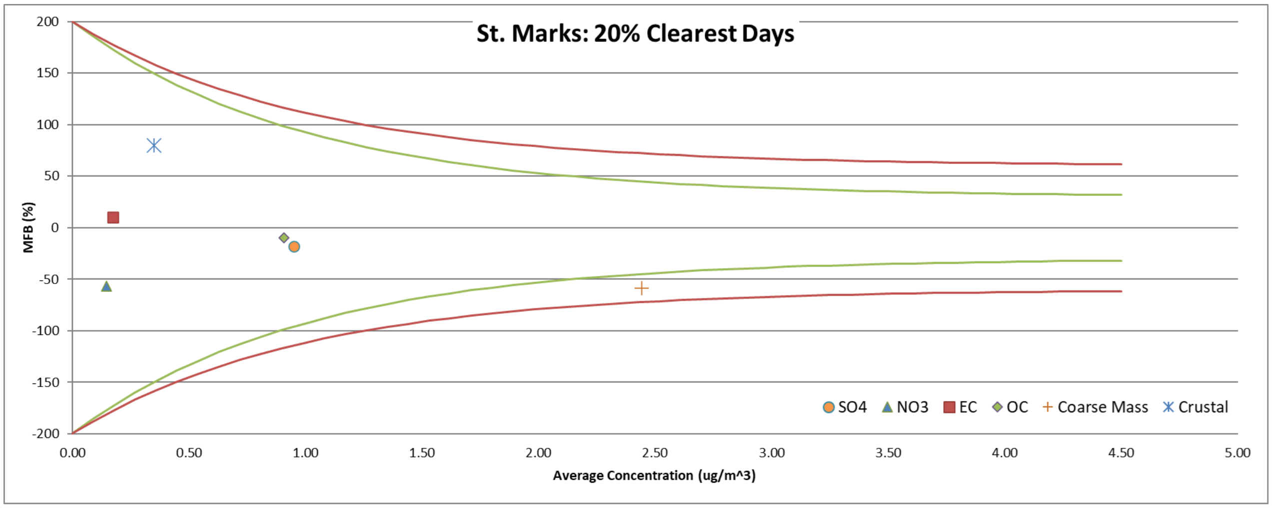


Figure 6-55: Bugle Plots of MFB (top) and MFE (bottom) for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Most Impaired at St. Marks



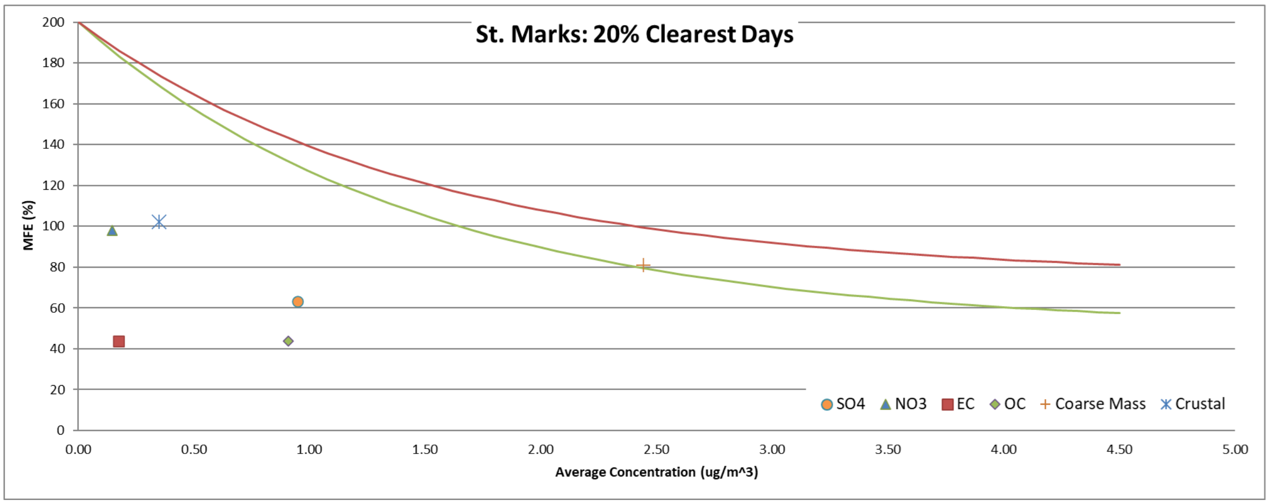


Figure 6-56: Bugle Plots of MFB (top) and MFE (bottom) for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Clearest Days at St. Marks

Figure 6-57 and Figure 6-58 are bugle plots showing MFB and MFE for modeled sulfate, nitrate, organic carbon, elemental carbon, crustal, and coarse mass for Everglades on the 20% most impaired days and the 20% clearest days. On the 20% most impaired days and the 20% clearest days, all species except coarse mass meet the MFB and MFE criteria (red line) and goal (green line).

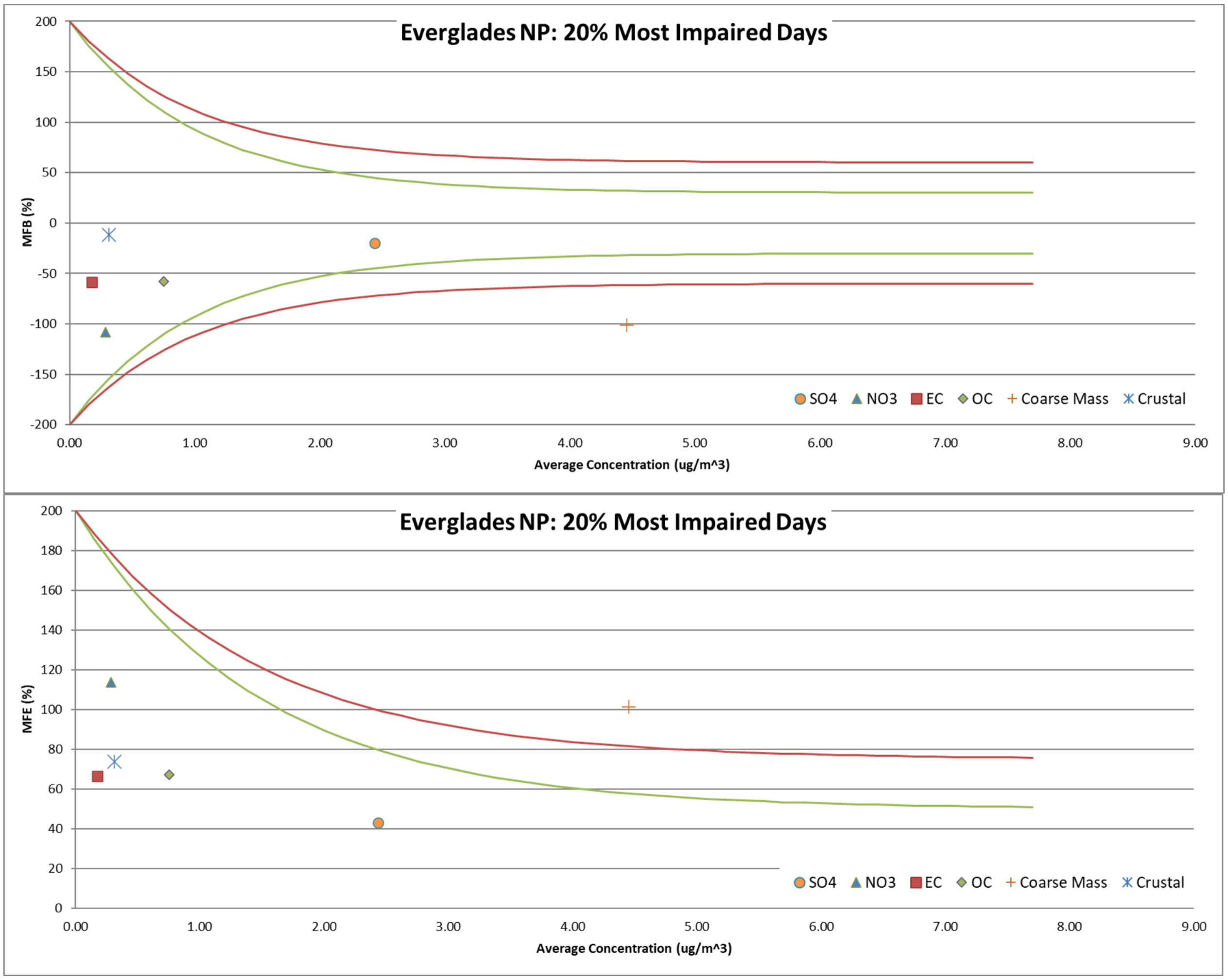


Figure 6-57: Bugle Plots of MFB (top) and MFE (bottom) for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Most Impaired Days at Everglades

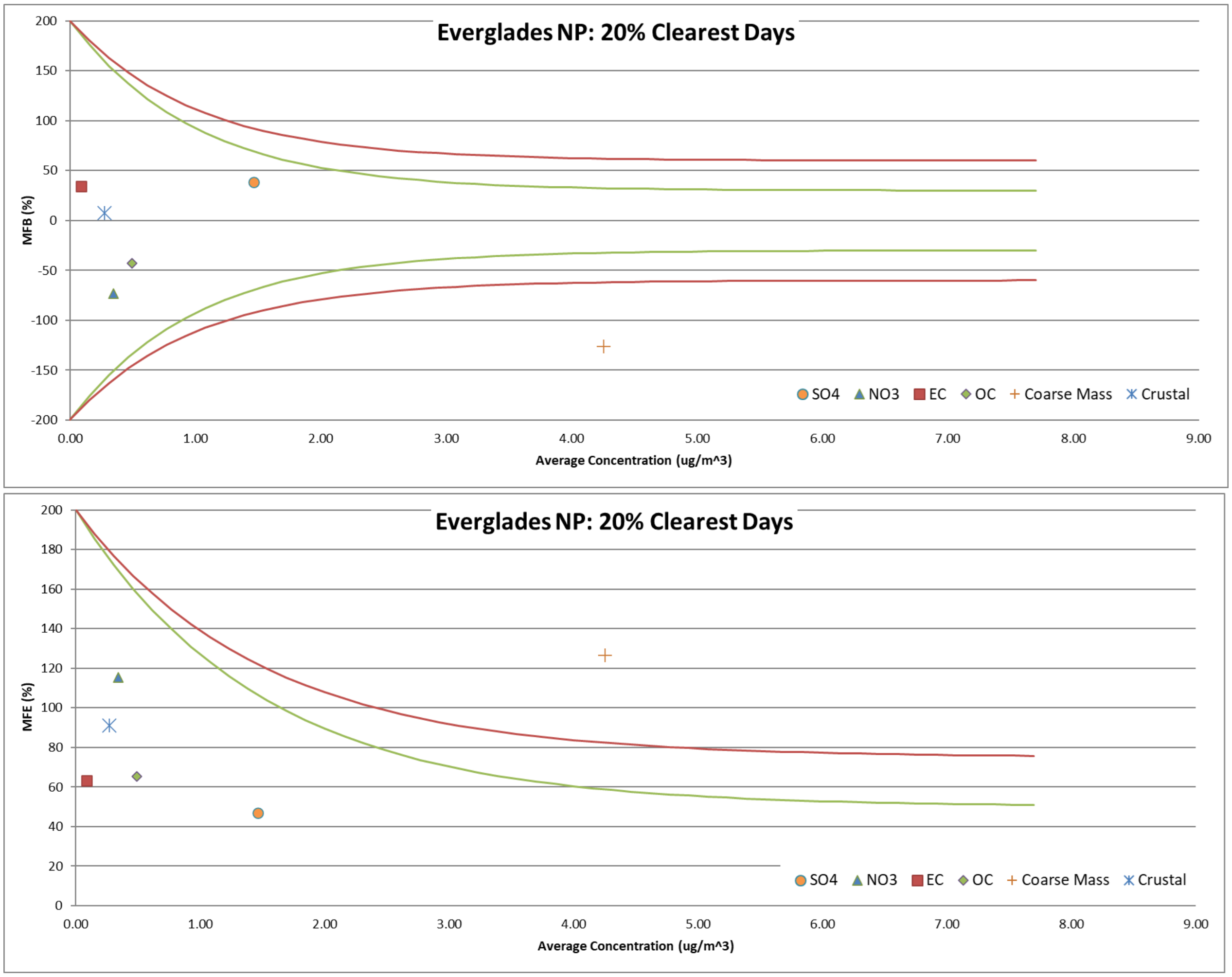


Figure 6-58: Bugle Plots of MFB (top) and MFE (bottom) for Sulfate, Nitrate, Elemental Carbon, Organic Carbon, Coarse Mass, and Crustal Concentrations on the 20% Clearest Days at Everglades

6.6. Model Performance for Everglades

The VISTAS modeling performed well at every Class I area with the exception of Everglades, where the Department identified issues affecting model performance. Because of these issues, Florida is relying on EPA's regional haze modeling for Everglades visibility projections and reasonable progress goal development. Additional information on EPA's modeling and model performance including boundary conditions discussion and detailed graphics can be found in EPA's regional haze modeling TSD.[39] The Department identified several key differences in EPA's modeling that lead to improved model performance at Everglades compared to the VISTAS modeling:

[39] Availability of Modeling Data and Associated Technical Support Document for the EPA's Updated 2028 Visibility Air Quality Modeling. Richard A. Wayland Memorandum, U.S. EPA OAQPS. September 19, 2019. Available at https://www.epa.gov/visibility/technical-support-document-epas-updated-2028-regional-haze-modeling.

- EPA used an expanded modeling domain;
- EPA used updated boundary conditions, including marine offshore emissions; and
- EPA used a more recent base year, allowing for better 2028 emissions projections.

These are discussed further in this section as part of the weight of evidence demonstrating that Everglades visibility projections are likely to be below the URP in 2028.

<u>Expanded Modeling Domain</u>

As seen in Figure 5-1 and Figure 6-59, Everglades is located near the southern edge of the VISTAS modeling domain, making Everglades very sensitive to boundary conditions, which are held constant between the base year and 2028. The significant influence of boundary conditions on local air quality at Everglades (accounting for over 85% of the sulfates contribution to visibility impairment, see Figure 6-60) makes the VISTAS model less responsive to local emissions changes.

Figure 6-59: VISTAS 12km modeling domain and location of Everglades IMPROVE Monitor (white circle)

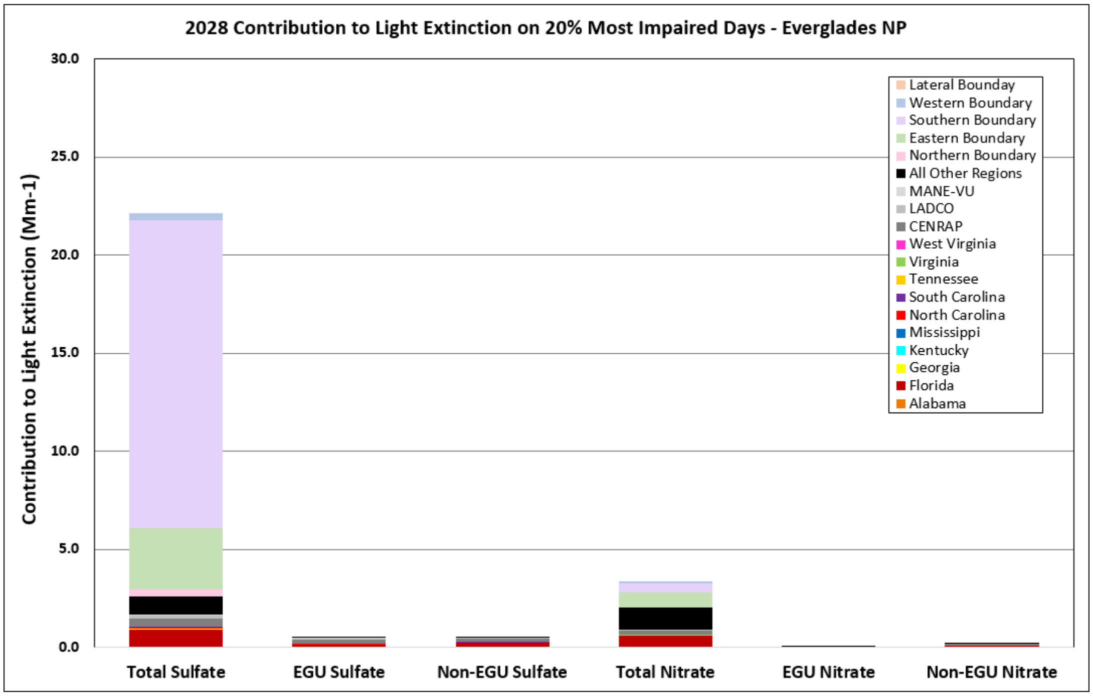


Figure 6-60: 2028 Contribution to Light Extinction on the 20% Most Impaired Days at Everglades

As shown in Figure 6-61, EPA's modeling uses a significantly expanded 36-km modeling domain which reduces the impact of boundary conditions assumptions. This significantly reduces the influence from boundary conditions at Everglades.

Figure 6-61: Map of the CAMx modeling domains used in EPA's regional haze modeling (blue rectangle: 36-km domain; red rectangle: 12-km domain).

<u>Updates to Boundary Conditions and Marine Offshore Emissions</u>

Whereas the VISTAS boundary conditions were held constant between the base year and 2028, EPA's modeling used more up-to-date boundary conditions compared to the VISTAS modeling along with some updates between the base year and 2028. EPA's modeling used boundary conditions derived from outputs from a hemispheric version of the Community Multi-scale Air Quality (CMAQ) model that used updated global emissions. One update between the base year and 2028 that significantly impacts Everglades is updates to offshore ship emissions outside the North American Emission Control Area (ECA, Figure 6-62) between the 2016 base year and 2028.

In most places, the ECA extends to a distance covering a country's exclusive economic zone (EEZ), which is 200 nautical miles from the coast. One exception is in the area around Florida, where the U.S. EEZ is much smaller because of the proximity to the Bahamas and Cuba EEZ. Figure 6-63 shows the ship traffic density around south Florida.[40] Figure 6-64 shows that prevailing winds in south Florida and Everglades are form the east-southeast at least half the year. Therefore, with the much smaller EEZ, significant ship traffic, and prevailing winds, Everglades is significantly impacted by SO_2 emissions from marine sources, especially those outside the ECA. While both VISTAS and EPA take into account the lower fuel sulfur standards within the ECA, EPA's modeling also takes into account the change in marine fuel sulfur standards outside the ECA from 35,000 ppm to 5,000 ppm effective January 1, 2020. These updated boundary emissions reduced the amount of SO_2 coming into the 12km domain in 2028, improving the 2028 visibility projections for Everglades.

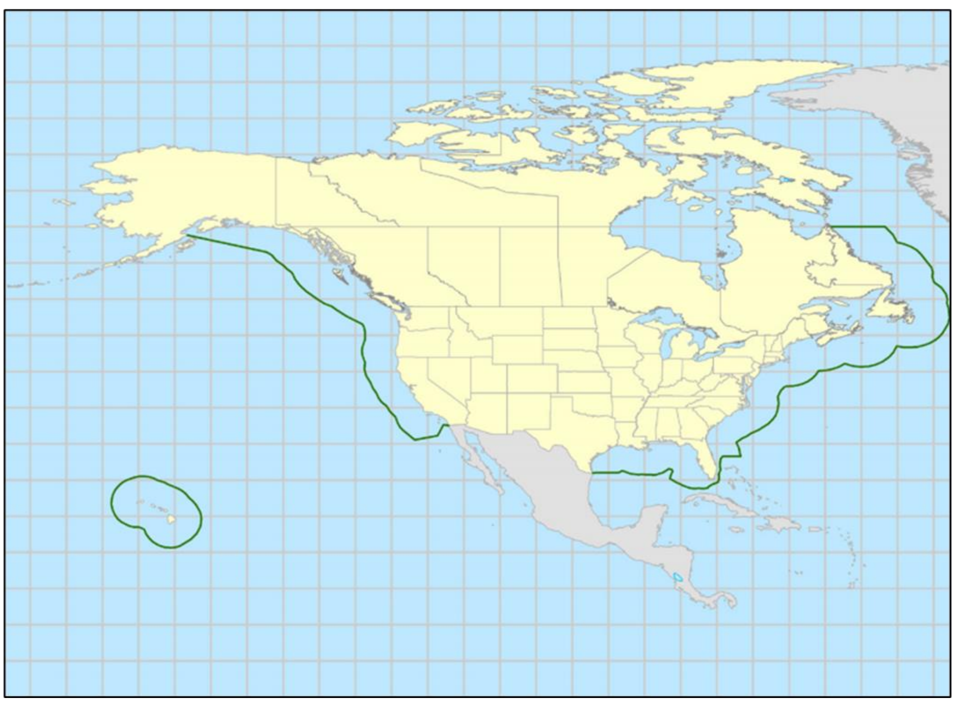


Figure 6-62: North American Emission Control Area

[40] Based on U.S. Coast Guard's Automatic Identification System (AIS) Data. URL: https://www.marinevesseltraffic.com/FLORIDA-STRAIT/ship-traffic-tracker

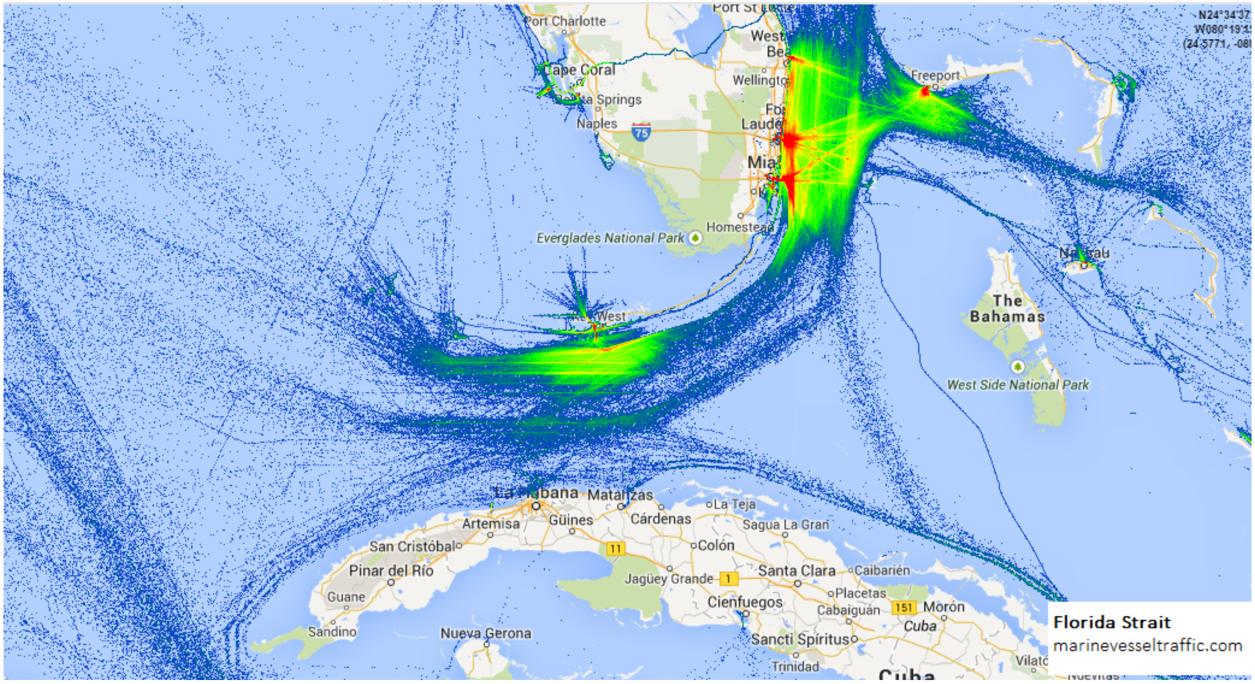


Figure 6-63: Ship traffic density around southern Florida

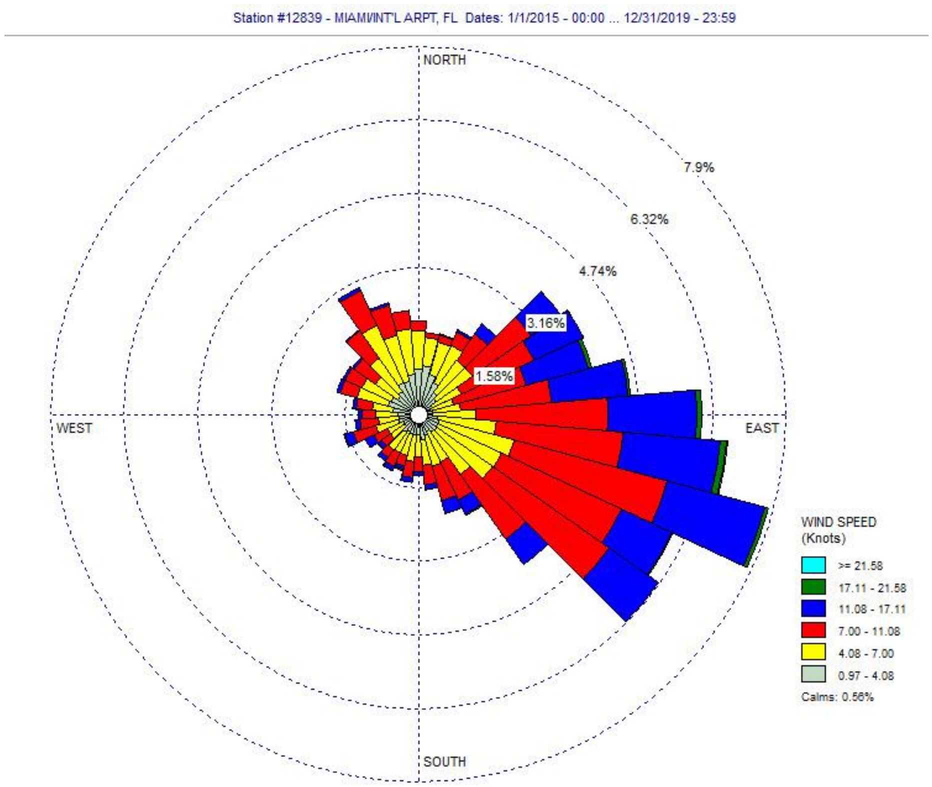


Figure 6-64: 2015-2019 Wind rose for Miami International Airport ASOS Station

Figure 6-65 helps demonstrate visually how EPA's expanded modeling domain and updated boundary conditions result in improved modeled projections for Everglades. The left panel shows the base year and 2028 modeling projections for VISTAS Class I areas in the VISTAS modeling. All Class I areas show a similar rate of change from the base year to 2028 except for Everglades, which has a much lower rate of change. This is reflective of the large influence from boundary conditions, which are held constant from the base year to 2028. In the right panel, which shows EPA's modeling projections, Everglades visibility projections have a similar rate of change compared to other VISTAS Class I areas. If all non-U.S. and offshore emissions had been held constant between 2016 and 2028 in EPA's modeling, the slope of the Everglades projection in the EPA modeling may have been flatter and more similar to the VISTAS results.

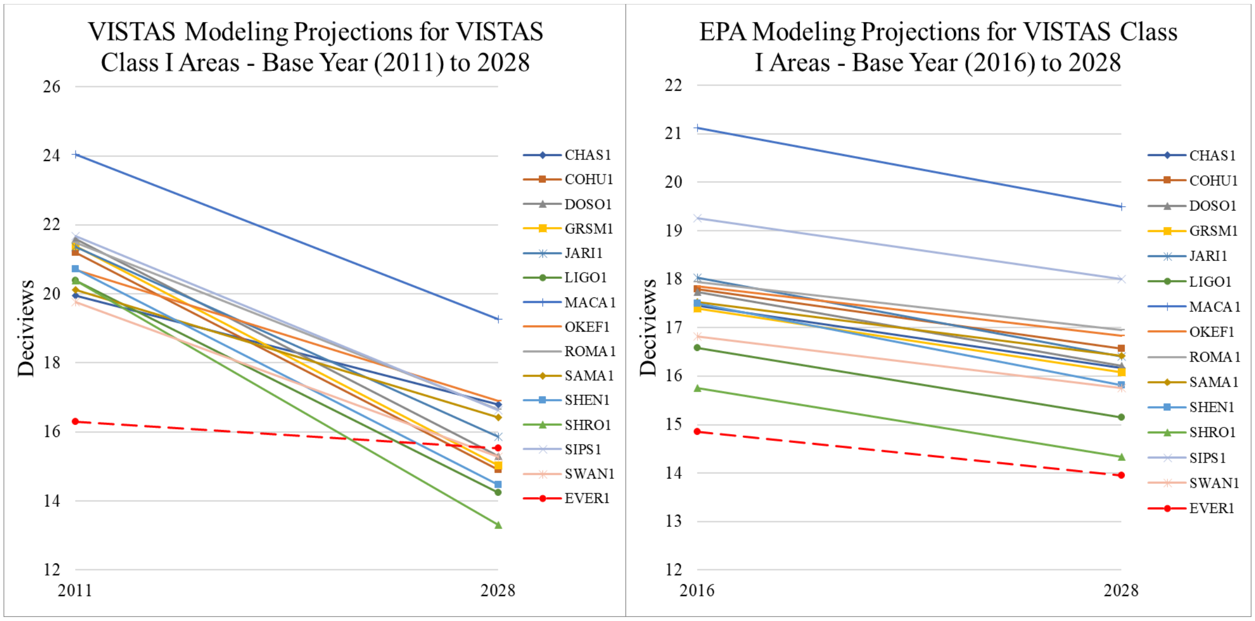


Figure 6-65: Base year and 2028 modeling projections for VISTAS Class I areas

<u>More Recent Base Year</u>

EPA's modeling also used a more recent base year than the VISTAS modeling (2016 vs. 2011). Between 2011 and 2016, SO_2 emissions from industrial sources in Florida, the most significant source of SO_2 in Florida, had already dropped by 45%. Table 6-9 below shows facilities where emissions dropped at least 1,000 tpy between 2011 and 2016. These sources account for almost 99% of the industrial source SO_2 decrease in Florida between 2011 and 2016. Beginning with a more recent base year is partly why EPA's visibility projections for Everglades and other Class I areas, as seen in Figure 6-65, are lower than VISTAS's visibility projections. Starting from a more recent base year allows for more accurate emissions projections to the future year 2028 that take into account more recent SO_2 emissions reductions.

The significant drop in emissions from these sources is also reflected in the improvement in visibility impairment over the last several years, as shown in Figure 2-9 through Figure 2-11. A significant portion of visibility improvements are due to reductions in sulfates. Figure 6-65 above also shows the significant improvement in visibility from the 2011 base year in the VISTAS modeling and the 2016 base year in EPA's modeling.

Table 6-9: Comparison of 2011 and 2016 emissions for large SO_2 sources in Florida. The table shows sources with emissions decreases of more than 1,000 tpy from 2011 to 2016.

Facility ID	Facility Name	2011 SO_2	2016 SO_2	Difference
0170004	DUKE CRYSTAL RIVER POWER PLANT	26,162	11,816	-14,346
1070025	SEMINOLE GENERATING STATION	14,970	5,844	-9,126
0310045	JEA NORTHSIDE GENERATING STATION	14,917	5,880	-9,037
0050014	FPL SMITH ELECTRIC GENERATING PLANT	6,037	462	-5,575
1050004	LAKELAND C.D. MCINTOSH, JR. POWER PLANT	4,257	1,275	-2,982
0570039	TECO BIG BEND STATION	9,106	6,213	-2,893
1010017	DUKE ANCLOTE POWER PLANT	2,134	11	-2,123
0330045	FPL GULF CLEAN ENERGY CENTER (CRIST)	2,526	739	-1,787
0010006	GRU DEERHAVEN GENERATING STATION	2,041	352	-1,689
0470002	NUTRIEN WHITE SPRINGS PHOS, SWA RIV & SW	3,229	1,566	-1,663
0890003	WESTROCK FERNANDINA BEACH MILL	3,717	2,279	-1,437
0050009	WESTROCK PANAMA CITY MILL	2,392	1,011	-1,381
0570008	MOSAIC FERTILIZER-RIVERVIEW FACILITY	3,034	1,804	-1,230

2028 SO_2 Emissions Projections

As part of Florida's evaluation of the appropriateness of using EPA's model for Everglades, Florida has also compared the 2028 point source emissions inventories for SO_2 between VISTAS and EPA. Overall, the VISTAS non-EGU SO_2 inventory was about 6,500 tpy lower than EPA's inventory, due to known, permitted non-EGU emissions reductions and shutdowns. The VISTAS EGU SO_2 inventory was about 11,600 tpy higher than EPA SO_2 inventory, mainly due to EPA's IPM model shutting down facilities or switching units from coal to natural gas, where there were no permitted plans to make those changes when VISTAS put together the 2028 inventory.

Although EPA's EGU and non-EGU point source inventory was overall ~5,000 tpy of SO_2 lower than the VISTAS point source inventory, the facilities with the most significant differences between the two inventories are located over 200 km to the north and northwest of Everglades. Considering this distance, plus the fact that the prevailing winds at Everglades are from the east-southeast more than half the year, indicates that these differences in the SO_2 point source inventories are unlikely to have a significant impact on the modeled visibility results at Everglades. In addition, as described further below, EPA's 2028 SO_2 emissions in some cases better reflect recent emissions reductions, making VISTAS 2028 emissions conservatively high.

Table 6-10 shows all facilities where the EPA and VISTAS emissions were different by 1,000 tpy or more of SO_2. These differences in SO_2 emissions are due to the following reasons:

- EPA's IPM model shut down the CD McIntosh Power Plant. At the time VISTAS put together the 2028 emissions inventory, there were no plans to shut down the coal unit at this facility. However, the coal-fired steam generator Unit 3 (EU006) was permanently shutdown in 2021. Therefore, EPA's 2028 model projection for SO_2 emissions accurately reflects the 2021 shutdown and is more accurate than the older VISTAS 2028 projection.
- TECO Big Bend has shut down Unit 1, which is being repowered with a new NGCC. Big Bend Unit 2 has been converted to natural gas only, and Unit 3 is currently firing natural gas only but continues to have coal-firing capabilities. Units 2 and 3 are expected to be shut down by the end of 2023. Unit 4 has also been permitted to fire natural gas and is expected to co-fire coal and natural gas for the foreseeable future. The VISTAS modeled emissions are conservatively high compared to recent operational changes, as the VISTAS model projected coal-firing in Units 3 and 4 through 2028. Therefore, EPA's 2028 model projection more accurately reflects SO_2 emissions at Big Bend than the older VISTAS 2028 projection.
- EPA's IPM model shut down the Seminole Generating Station. There are currently no plans to shut down this facility. However, the facility does have a permit to shut down either Unit 1 or Unit 2, which is reflected in the VISTAS inventory. Therefore, VISTAS 2028 model projection more accurately reflects SO_2 emissions at Seminole Generating Station than the EPA's 2028 projection at this time.
- EPA's modeled SO_2 emissions for WestRock Panama City Mill are more reflective of recent emissions reductions resulting from reduced coal and No. 6 fuel oil usage. The VISTAS emissions reflect the previous fuel mix of higher sulfur fuels and are conservatively high. This facility underwent a four-factor reasonable progress analysis.
- EPA's model assumed much lower SO_2 emissions from OUC Stanton. However, the VISTAS emissions for the facility reflect recent actual emissions for Units 1 and 2. OUC Stanton has announced that it will end coal-firing by the end of 2027, and the units are already co-firing some natural gas. Therefore, both EPA and VISTAS projected emissions for 2028 are conservatively high based on this announcement.
- VISTAS emissions for Foley Mill reflect emissions as they were at the time the 2028 inventory was first put together. However, more recent SO_2 emissions (2019) have been around 2,000 tpy. Therefore, VISTAS emissions are somewhat low and EPA emissions are conservatively high for this facility. This facility underwent a four-factor for a reasonable progress analysis.
- Mosaic Plant City stopped operating in 2017 and shutdown in 2019, which is reflected in VISTAS 2028 inventory with zero SO_2 emissions. EPA's model did not reflect the shutdown and still had emissions for this facility. Therefore, VISTAS' 2028 model projection for SO_2 emissions accurately reflects the 2019 shutdown and is more accurate than EPA's 2028 projection.
- Mosaic New Wales completed significant work to reduce both actual and allowable SO_2 emissions to bring the Hillsborough-Polk area back into attainment of the 2010 SO_2

NAAQS. The facility made significant expenditures to upgrade the vanadium catalyst and is complying with a five-unit cap of 1,090 lb/hr on a 24-hour block average as determined by CEMS. This work is reflected in the VISTAS 2028 inventory. Therefore, VISTAS' 2028 model projection for SO_2 emissions accurately reflects the recently installed SO_2 controls and is more accurate than EPA's 2028 projection.

- Gulf Clean Energy Center (Crist) no longer fires coal in any units and only fires natural gas and limited fuel oil. EPA's emissions for this facility are too high because they reflect past higher SO_2 emissions from coal usage. Therefore, VISTAS' 2028 model projection for SO_2 emissions accurately reflects the fuel switch and is more accurate than EPA's 2028 projection.

Table 6-10: 2028 SO_2 Emissions Comparison Between VISTAS and EPA Modeling

EIS Facility ID	Facility	SO_2 2028 VISTAS Remodel (tpy)	SO_2 2028 EPA Model (tpy)	VISTAS minus EPA
1050004	C.D. MCINTOSH, JR. POWER PLANT	4,202	0	4,202
0570039	BIG BEND STATION	6,085	2,256	3,829
1070025	SEMINOLE GENERATING STATION	3,713	0	3,713
0050009	WESTROCK PANAMA CITY MILL	2,591	1,098	1,493
0950137	STANTON ENERGY CENTER	2,691	1,574	1,117
1230001	FOLEY MILL	1,520	2,658	-1,138
0570005	MOSAIC FERTILIZER -PLANT CITY FACILITY	0	1,739	-1,739
1050059	MOSAIC FERTILIZER - NEW WALES FACILITY	4,491	7,424	-2,933
0330045	GULF CLEAN ENERGY CENTER (CRIST)	572	3,864	-3,292

In addition to EPA's modeling projecting Everglades below the URP in 2028, the current (2014-2018) observed visibility projections at Everglades are already below the 2028 uniform rate of progress (the current visibility is 14.90 dv and the 2028 point on the URP is 15.04 dv), and emissions of visibility-impairing pollutants are expected to continue to decline through 2028 due to additional unit shutdowns and fuel switches (documented in Section 7.6.5). This provides additional weight of evidence to support the conclusion that Everglades will be below the URP in 2028.

6.7. Model Performance for Other Class I Areas

Aside from the issues for Everglades discussed above, Florida found the overall VISTAS model performance to fall within acceptable limits for other Class I areas. Florida further asserts the one atmosphere modeling performed by the VISTAS contractors is representative of conditions in the southeastern states and is acceptable for use in regulatory demonstrations to support Florida's Regional Haze SIP. Florida will rely on the VISTAS modeling for Chassahowitzka and St. Marks visibility projections and reasonable progress goal development.

7. Long-Term Strategy Development

The regional haze regulation under 40 CFR 51.308(f)(2) requires states to submit a long-term strategy addressing regional haze visibility impairment for each mandatory federal Class I area within the state and for each mandatory federal Class I area located outside the state that may be affected by emissions from the state. The long-term strategy must include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to make reasonable progress. The regional haze regulation also requires under 40 CFR 51.308(f)(3) that states containing mandatory federal Class I areas must establish RPGs expressed in dv. These RPGs must reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period as a result of those enforceable emission limitations, compliance schedules, and other measures established as part of the long-term strategy as well as the implementation of other CAA requirements. The RPGs, while not directly federally enforceable, must be met through measures contained in the state's long-term strategy through the year 2028. This section discusses development of Florida's long-term strategy.

7.1. Overview of the Long-Term Strategy Development Process

The monitor data and the modeling analyses included with the first regional haze SIP established that, for the VISTAS region, the key contributors to regional haze in the 2000-2004 baseline timeframe were large stationary sources of SO_2 emissions. Figure 2-1, Figure 2-2, and Figure 2-3 show the daily visibility data for the 20% most impaired days during the baseline period for Chassahowitzka, Everglades, and St. Marks, respectively. Sulfate accounted for the vast majority of the pollutant-impairing species on these days. Visibility data for the baseline period for most VISTAS Class I areas showed this same trend.

More current speciation data for years 2014 through 2018 show significant visibility improvement on the 20% most impaired days. As shown in Figure 2-9 through Figure 2-11 for Chassahowitzka, Everglades, and St. Marks, respectively, sulfates continue to be the predominant visibility impairing species. Unlike the data for the baseline period of 2000 to 2004, where nearly all days with poor visibility were heavily dominated by sulfate impairment, the 2014 to 2018 data show some 20% most impaired days having large organic matter or nitrate impacts at Florida Class I areas. The organic matter components on poor visibility days are associated with episodic events while the nitrate components are associated with anthropogenic emissions. However, the visibility during the majority of 20% most impaired days at Florida Class I areas during the period 2014 to 2018 continue to be impacted most heavily by sulfate. Therefore, reducing SO_2 emissions continues to be important for generating further visibility improvements. Keeping this conclusion in mind, this section addresses the following questions:

- Assuming implementation of existing federal and state air regulatory requirements in Florida and the VISTAS region, how much visibility improvement, compared to the glide path, is expected at Chassahowitzka, St. Marks, and Everglades by 2028?
- Which mandatory federal Class I areas located outside of Florida are significantly impacted by visibility impairing pollutants originating from within Florida?
- If additional emission reductions were needed, from what pollutants and source categories would the greatest visibility benefits be realized by 2028?
- Where are these pollutants and source categories located?
- Which specific individual sources in those geographic locations have the greatest visibility impacts at a given mandatory federal Class I area?
- What additional emission controls represent reasonable progress for those specific sources?

7.2. Expected Visibility in 2028 for Florida Class I Areas Under Existing and Planned Emissions Controls

Several significant control programs reduce emissions of visibility impairing pollutants between the base year 2011 and the future year projection year of 2028. These programs are described in more detail below.

7.2.1. Federal Control Programs Included in the 2028 Projection Year

Federal control programs impacting onroad and off-road engines as well as industrial and EGU facilities have reduced, and will continue to reduce, emissions of SO_2 and NO_X. The reductions from these programs, as described below, are included in the 2028 future year estimates upon which visibility projections are based.

7.2.1.1. Federal EGU and Industrial Unit Trading Programs

The CAA requires each upwind state to ensure that it does not interfere with either the attainment of a NAAQS or continued compliance with a NAAQS at any downwind monitor. This section of the CAA, § 110(a)(2)(D)(i)(I), is called the "Good Neighbor" provision. The EPA has implemented a number of rules enforcing the Good Neighbor provision for a variety of NAAQS.

The EPA finalized CSAPR on August 8, 2011 (76 Fed. Reg. 48,208). This rule required 28 states to reduce SO_2, annual NO_X, and ozone season NO_X from fossil fuel-fired EGUs in support of the 1997 and 2006 $PM_{2.5}$ NAAQS and the 1997 ozone NAAQS. CSAPR relied on a trading program to achieve these reductions and became effective January 1, 2015, as set forth in an October 23, 2014, decision by the U.S. Court of Appeals for the D.C. Circuit. Phase 1 of the program began January 2015 for annual programs and May 2015 for the ozone season program. Phase 2 began

January 2017 for the annual programs and May 2017 for the ozone season program. Total emissions allowed in each compliance period under CSAPR equals the sum of the affected state emission budgets in the program. The 2017 budgets for these programs, exclusive of new unit set asides and tribal budgets, are:

- SO_2 Group 1 – 1.37 million tons,
- SO_2 Group 2 – 892,000 tons,
- Annual NO_X – 1.21 million tons, and
- Ozone Season NO_X – 586,000 tons

EPA published revised CSAPR ozone season NO_X budgets to address the 2008 ozone NAAQS on October 26, 2016 (81 Fed. Reg. 74,504). This rule, called the CSAPR Update, reduced state budgets for NO_X during the ozone season to 325,645 tons in 2017 and 330,526 tons in 2018 and later years, exclusive of new unit set asides and tribal budgets. This rule applies to all VISTAS states except North Carolina, South Carolina, Georgia, and Florida and continues to encourage NO_X emissions reductions from fossil fuel-fired EGUs. The U.S. Court of Appeals for the D.C. Circuit remanded, but did not vacate, the CSAPR Update to EPA to address the court's holding that the rule unlawfully allows significant contributions to continue beyond downwind attainment deadlines. Therefore, the reductions required by the CSAPR Update rule remain in effect. Although CSAPR does not apply to Florida, Florida still benefits from reductions in neighboring states.

7.2.1.2. MATS Rule

On February 16, 2012 (77 Fed. Reg. 9,304), EPA promulgated the National Emission Standards for Hazardous Air Pollutants from Coal- and Oil-Fired Electric Steam Generating Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial-Institutional, and Small Industrial-Commercial-Institutional Steam Generating Units. This rule is often called the Mercury and Air Toxics Standard (MATS). The standard applies to EGUs burning fossil fuel and sets standards for certain HAP emissions, many of which are acid gases. Control of these acid gases often have the co-benefit of reducing SO_2 emissions. Sources had until April 16, 2015, to comply with the rule unless granted a one-year extension for control installation or an additional extension for reliability reasons.

7.2.1.3. 2010 SO_2 NAAQS

On June 22, 2010 (75 Fed. Reg. 35,520), EPA finalized a new primary NAAQS for SO_2. This regulation significantly strengthened the short-term requirements by lowering the standard to 75 ppb on a one-hour basis. Using inventory and other technical data as support, EPA determined that anthropogenic SO_2 emissions originate chiefly from point sources, with fossil fuel combustion at electric utilities accounting for 66% and fossil fuel combustion at other industrial facilities accounting for 29% of total anthropogenic SO_2 emissions. EPA simultaneously revised ambient air monitoring requirements for SO_2, requiring fewer monitors due to the use of a hybrid approach combining air quality modeling and monitoring to determine compliance with the new standard. Much of this work focuses on the evaluation of point source emissions.

After promulgation of the 2010 SO_2 NAAQS, EPA designated two areas in Florida nonattainment due to ambient monitoring data being above the new design value. These were the Hillsborough County nonattainment area and the Nassau County nonattainment area. Four facilities (Mosaic Riverview, TECO Big Bend, Rayonier Performance Fibers, and WestRock Fernandina Beach) were required to significantly reduce SO_2 emissions to comply with the 2010 SO_2 NAAQS in these areas. The Hillsborough nonattainment area and Nassau County nonattainment area were subsequently redesignated to attainment after improved ambient monitoring data demonstrated that the 2010 SO_2 NAAQS was being met.

In addition, EPA's Data Requirements Rule required states to identify large sources of SO_2 and characterize the air quality around these sources, either through air monitoring or air quality modeling, to evaluate whether these areas were attaining the 2010 SO_2 NAAQS. Florida completed eleven area characterizations addressing twelve SO_2 sources with air quality modeling. As a result of this analysis, EPA designated one additional area in Florida nonattainment (the Hillsborough-Polk nonattainment area) for the 2010 SO_2 NAAQS. Two facilities (Mosaic New Wales and Mosaic Bartow) were required to significantly reduce SO_2 emissions to comply with the 2010 SO_2 NAAQS in this area. The Hillsborough-Polk nonattainment area was subsequently redesignated to attainment. Effective March 23, 2020, all of Florida is in compliance with the 2010 SO_2 NAAQS.

7.2.1.4. Onroad and Non-Road Programs

The CAA authorizes the EPA to establish emission standards for motor vehicles under § 202 and the authority to establish fuel controls under § 211. The CAA generally prohibits states other than California from enacting emission standards for motor vehicles under § 209(a) and for non-road engines under § 209(e). States may choose to adopt California requirements or meet federal requirements. Federal programs to reduce emissions from onroad and non-road engines are therefore critical to improving both visibility and air quality.

Several of the programs discussed below address SO_2 emissions by reducing allowable sulfur contents in various fuels. As well as reducing SO_2 emissions, reduced sulfur content improves the efficiency of NO_X controls on existing engines and facilitates the use of state-of-the-art NO_X controls on new engines.

7.2.1.4.1. 2007 Heavy-Duty Highway Rule

In Subpart P of 40 CFR Part 86, EPA set limitations for heavy-duty engines, which became effective between 2007 and 2010. This rule limited NO_X to 0.20 grams per brake horsepower-hour (g/bhp-hr) and limited non-methane hydrocarbons to 0.14 g/bhp-hr. The rule also required that the sulfur content of diesel fuel not exceed 0.0015% by weight to facilitate the use of modern pollution control technology on these engines. These standards continue to provide benefit as older vehicles are replaced with newer models.

7.2.1.4.2. Tier 3 Motor Vehicle Emissions and Fuel Standards

The federal Tier 3 program under Subpart H of 40 CFR Part 80, 40 CFR Part 85, and 40 CFR Part 86 reduces tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles. The tailpipe standards include different phase-in schedules that vary by vehicle class and begin to apply between model years 2017 and 2025. The Tier 3 gasoline sulfur standard, which reduced the allowable sulfur content to 10 parts per million (ppm) in 2017, allows manufacturers to comply across the fleet with the more stringent Tier 3 emission standards. Reduced sulfur content in gasoline will also enable the control devices on vehicles already in use to operate more effectively. Compared to older standards, the non-methane organic gases and NO_X tailpipe standards for light duty vehicles in this rule are 80% less than the existing fleet average. The heavy-duty tailpipe standards are 60% less than the existing fleet average.

7.2.1.4.3. Non-Road Diesel Emissions Programs

EPA promulgated a series of control programs in 40 CFR Part 89, Part 90, Part 91, Part 92, and Part 94 that implemented limitations by 2012 on compression ignition engines, spark-ignition non-road engines, marine engines, and locomotive engines. Environmental benefits continue into the future as consumers replace older engines with newer engines that have improved fuel economy and more stringent emissions standards. These regulations also required the use of cleaner fuels.

7.2.1.4.4. Emission Control Area Designation and Commercial Marine Vessels

On April 4, 2014, new standards for ocean-going vessels became effective and applied to ships constructed after 2015. These standards are found in MARPOL Annex VI,[41] the international convention for the prevention of pollution from ocean-going ships. These requirements also mandate the use of significantly cleaner fuels by all large ocean-going vessels when operated near the coastlines. The cleaner fuels lower SO_2 emission rates as well as emissions of other criteria pollutants since the engines operate more efficiently on the cleaner fuel. These requirements apply to vessels operating in waters of the United States as well as ships operating

[41] URL: https://www.epa.gov/sites/production/files/2016-09/documents/resolution-mepc-251-66-4-4-2014.pdf

within 200 nautical miles of the coast of North America, also known as the North American Emission Control Area (Figure 6-62). Ships within the ECA are limited to 1,000 ppm sulfur content beginning in 2020.

7.2.2. State Control Programs Included in the 2028 Projection Year

Under the North Carolina Clean Smokestacks Act, coal-fired power plants in North Carolina were required to achieve a 77% cut in NO_X emissions by 2009 and a 73% cut in SO_2 emissions by 2013.

Georgia Rule 391-3-1-.02(2)(sss) "Multi-Pollutant Control for Electric Utility Generating Units" established a schedule for the installation and operation of NO_X and SO_2 pollution control systems on many of the coal-fired power plants in Georgia. This rule, adopted in 2007, required controls for all affected units to be in place before June 1, 2015. The rule reduced SO_2 emissions by approximately 90%, NO_X emissions by approximately 85%, and mercury emissions by approximately 79%.

A number of consent agreements also impose specific controls that were included in this inventory development process:

- Lehigh Cement Company/Lehigh White Cement Company (US District Court, Eastern District of Pennsylvania): EPA reached a settlement with these companies on December 3, 2019, to settle alleged violations of the CAA. The settlement will reduce emissions of NO_X and SO_2 and applied to facilities located in serval states, including Alabama.

- VEPCO (US District Court, Eastern District of Virginia): Virginia Electric and Power Company (also known as Virginia-Dominion Power) agreed to spend $1.2 billion by 2013 to eliminate 237,000 tons of SO_2 and NO_X emissions each year from eight coal-fired electricity generating plants in Virginia and West Virginia.

- Anchor Glass Container (US District Court for the Middle District of Florida): On August 3, 2018, Anchor agreed to convert six of its furnaces to oxyfuel furnaces and will meet NO_X emission limits at these furnaces that are consistent or better than best available control technology. On remaining furnaces, Anchor agreed to install oxygen enriched air staging and meet more stringent emission limits. To control SO_2, Anchor agreed to install dry or semi-dry scrubber systems on two furnaces. Remaining furnaces must achieve batch optimization and meet enforceable emissions limits. Anchor also agreed to install NO_X and SO_2 continuous emissions monitoring systems at all furnaces. The expected emission reductions from the agreement are 2,000 tpy of NO_X and 700 tpy of SO_2 at facilities located in Florida, Georgia, Indiana, Minnesota, New York and Oklahoma.

- Nutrien White Springs Agricultural Chemicals, Inc.: As part of a consent decree with EPA, Nutrien in White Springs, FL was required to reduce SO_2 emissions and meet more stringent SO_2 emission limits at sulfuric acid plant (SAP) C, D, E and F. Nutrien elected to permanently shut down SAPs C and D in 2014, reducing emissions from these SAPs to zero. SAPs E and F are fully compliant with the consent decree limits as of January 2020.

7.2.3. Construction Activities, Agricultural and Forestry Smoke Management

In addition to accounting for specific emission reductions due to ongoing air pollution programs as required under the regional haze regulation section 40 CFR 51.308(f)(2)(iv)(B), states are also required to consider the air quality benefits of measures to mitigate the impacts of construction activities (40 CFR 51.308(f)(2)(iv)(B)) and agricultural and forestry smoke management (40 CFR 51.308(f)(2)(iv)(D)). Section 7.9.1 and Section 7.9.2 provide more information on these activities.

7.2.4. Projected VISTAS 2028 Emissions Inventory

The VISTAS emissions inventory for 2028 account for post-2011 emission reductions from promulgated federal, state, local, and site-specific control programs, many of which are described in Section 7.2.1 and Section 7.2.2. The VISTAS 2028 emissions inventory is based on EPA's 2028el emissions inventory data sets.[42] Onroad and non-road mobile source emissions were created for 2028 using the MOVES model. Nonpoint area source emissions were prepared using growth and control factors simulating changes in economic conditions and environmental regulations anticipated to be fully implemented by calendar year 2028. For EGU sources in projected year 2028, VISTAS states considered the EPA 2028el, the EPA 2023en, or 2028 emissions from the ERTAC EGU projection tool CONUS2.7 run and CONUS16.0 run. The EPA 2028el emissions inventory for EGUs considered the impacts of the CPP, which was later vacated. Additionally, the EPA 2028el EGU emissions inventory used results from IPM. IPM assumes units may retire or sit idle in future years based solely on economic decisions determined within the tool. Impacts of the CPP, IPM economic retirements, and IPM economic idling resulted in many coal-fired EGUs being shut down. Thus, the EPA 2028el projected emissions for EGU are not reflective of probable emissions for 2028. The ERTAC EGU tool outputs do not consider the impacts of the CPP. For states outside of VISTAS, EGU estimates were derived from CONUS16.0 and CONUS16.1 outputs. For non-EGU point source projections to year 2028, VISTAS states considered the EPA 2023en and EPA 2028el emissions and in some cases supplied their own emissions data. In particular, North Carolina developed their own 2028 non-EGU point source emissions inventory based on application of growth and control factors to

[42] URL: ftp://ftp.epa.gov/EmisInventory/2011v6/v3platform/2028emissions/

their most recent year (2016) non-EGU point source inventory. Georgia used 2016 emissions (or 2014 emissions if 2016 was not available) to represent 2028 emissions for the 33 non-EGU facilities with over 100 tpy of SO_2 in 2011, exclusive of Hartsfield-Jackson Atlanta International Airport. Florida EGU estimates for 2028 were based on a combination of ERTAC, 2011el, 2023en, and 2028el data, to reflect expected emissions in 2028 based on on-the-books controls.

These updates for 2028 are documented in the ERG emissions inventory reports included in Appendix B-2a.

Figure 7-1 and Figure 7-2 show the expected decrease in emissions of SO_2 and NO_X, respectively, across the VISTAS states from 2011 to 2028.

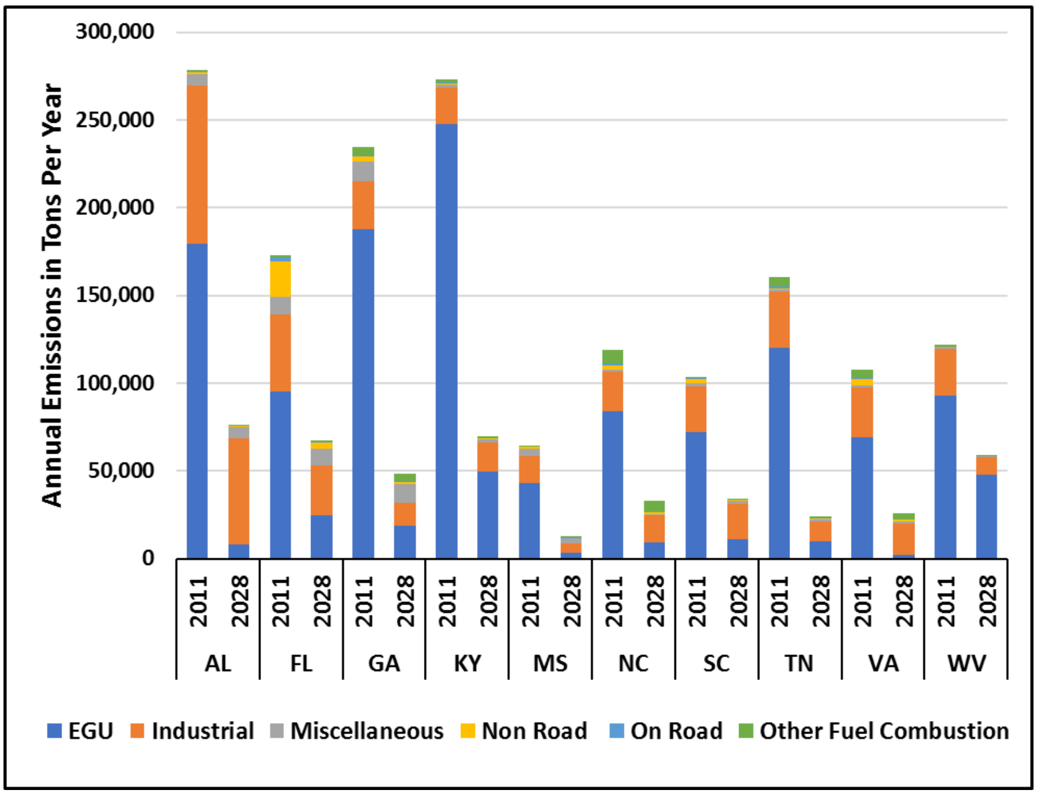


Figure 7-1: SO_2 Emissions for 2011 and 2028 for VISTAS States

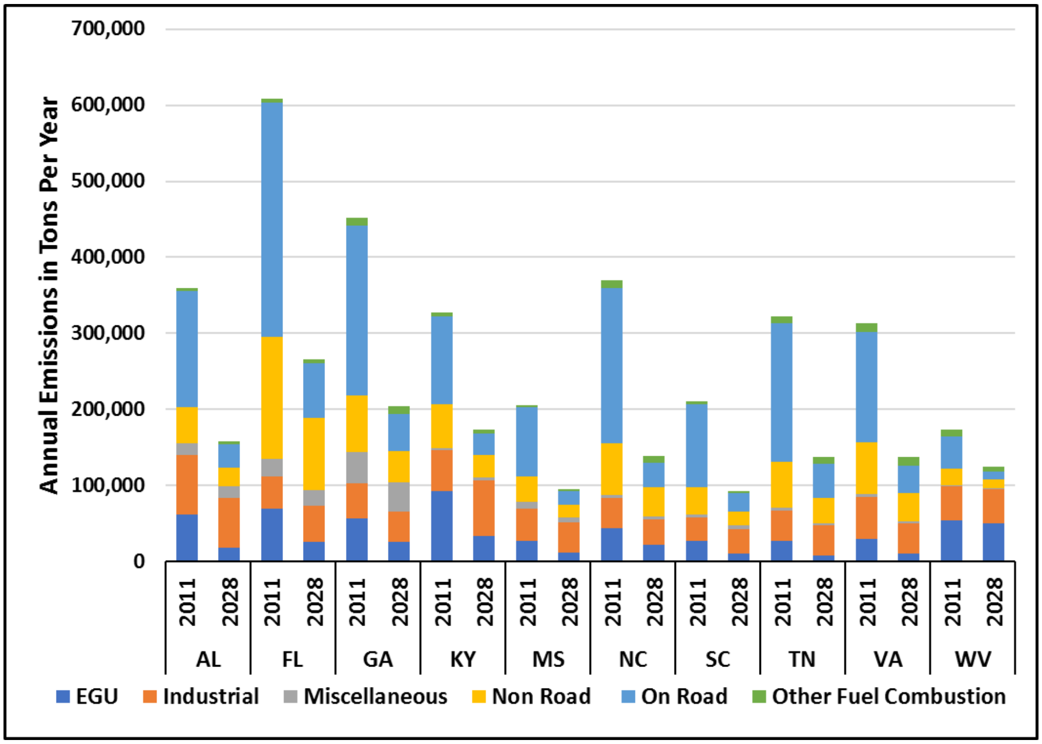


Figure 7-2: NO_X Emissions for 2011 and 2028 for VISTAS States

For SO_2 emissions in particular, which are the largest contributors to haze, emissions across VISTAS are expected to decrease from 1,633,000 tons in 2011 to 448,000 tons in 2028, a 73% decrease. The EGU sector accounts for most of the SO_2 reductions although in some states industrial SO_2 emissions are also expected to decrease significantly. Emissions of NO_X in VISTAS are projected to drop from 3,343,000 tons in 2011 to 1,528,000 tons in 2028, a 54% reduction. The majority of these reductions come from the onroad sector, and such reductions are heavily dependent on federal control programs due to the CAA prohibition regarding state regulation of engine controls. The NO_X reductions from the EGU sector are also expected to continue although NO_X from EGUs now make up a much smaller portion of the overall anthropogenic NO_X inventory as compared to inventories from prior the planning period. The expected SO_2 and NO_X emission reductions are due to state and federal control programs, the construction and operation of renewable energy sources and very efficient combined cycle generating units, the use of cleaner burning fuels, and other factors.

Figure 7-3 and Figure 7-4 show the 2011 and 2028 emissions for SO_2 and NO_X, respectively, in other areas of the country. These data show significant drops in both pollutants from all other RPOs. For Class I areas that are disproportionately impacted by emissions from states in RPOs other than VISTAS, these reductions will help improve visibility impairment by 2028.

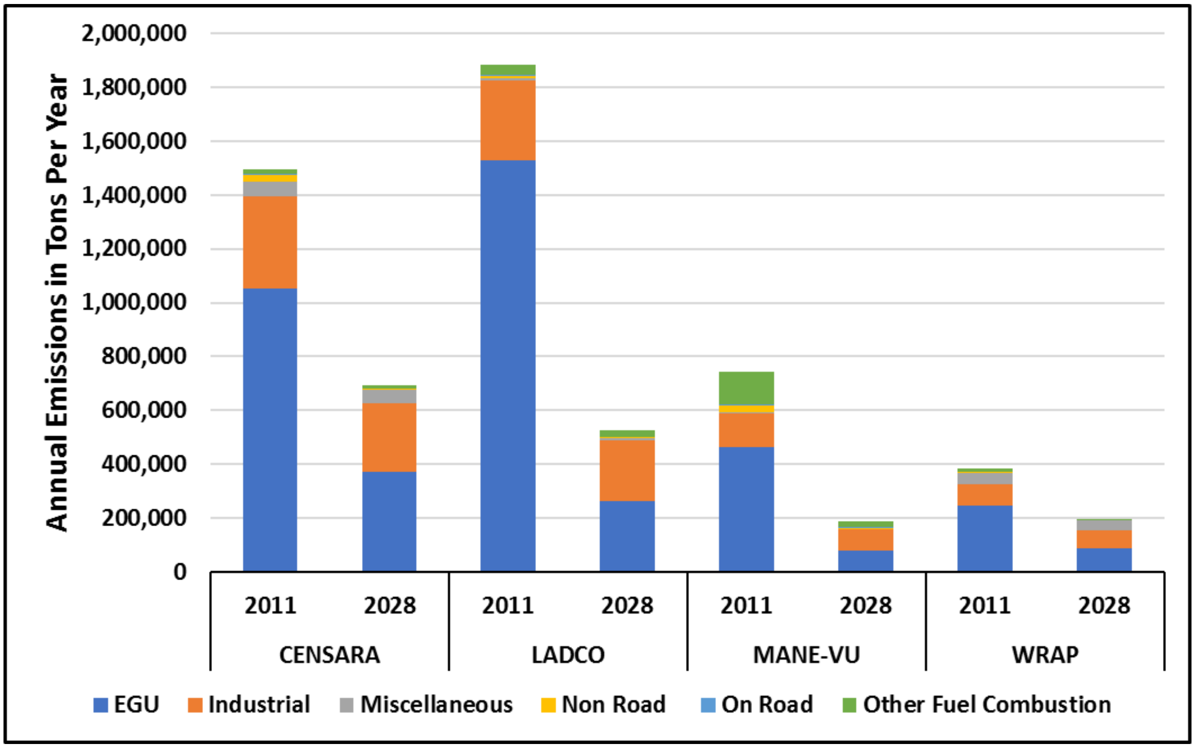


Figure 7-3: SO_2 Emissions for 2011 and 2028 for Other RPOs

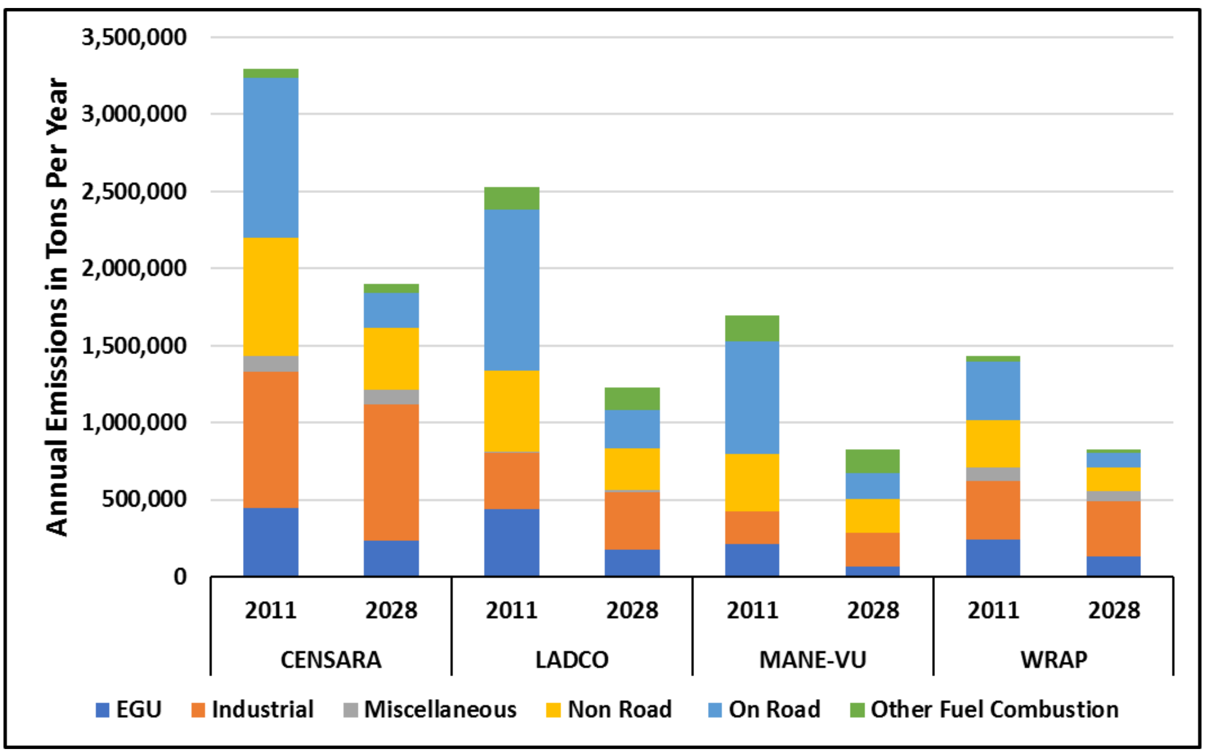


Figure 7-4: NO_X Emissions for 2011 and 2028 for Other RPOs

Table 7-1 summarizes criteria pollutant emissions by state and Tier 1 NEI source sector from the 2011 and 2028 emissions inventories. The complete inventories and discussion of the methodology are contained in Appendix B-2a.

Table 7-1: 2011 and 2028 Criteria Pollutant Emissions, VISTAS States

State	Tier 1 Sector	2011 CO (tpy)	2028 CO (tpy)	2011 NO_X (tpy)	2028 NO_X (tpy)	2011 PM_{10} (tpy)	2028 PM_{10} (tpy)	2011 $PM_{2.5}$ (tpy)	2028 $PM_{2.5}$ (tpy)	2011 SO_2 (tpy)	2028 SO_2 (tpy)	2011 VOC (tpy)	2028 VOC (tpy)
AL	Chemical & Allied Product Mfg	3,123	3,122	2,411	2,409	704	704	650	650	6,559	6,583	1,629	1,576
AL	Fuel Comb. Elec. Util.	9,958	6,748	61,687	18,098	7,323	1,714	4,866	1,190	179,323	7,965	1,152	910
AL	Fuel Comb. Industrial	71,865	73,890	35,447	27,842	46,274	47,304	34,664	39,088	41,322	18,806	3,283	3,413
AL	Fuel Comb. Other	12,104	11,352	4,229	4,100	1,689	1,584	1,654	1,549	417	193	2,038	1,796
AL	Highway Vehicles	701,397	182,602	152,732	30,113	8,001	4,984	4,611	1,322	683	262	75,523	15,013
AL	Metals Processing	10,991	10,759	5,947	5,434	5,359	4,326	4,647	3,844	13,298	13,072	1,843	1,550
AL	Miscellaneous	670,765	666,279	14,735	14,567	445,039	494,515	108,297	113,981	6,746	6,679	159,034	158,720
AL	Off-Highway	261,788	253,400	47,801	25,355	3,584	1,781	3,369	1,653	1,074	193	43,396	22,709
AL	Other Industrial Processes	19,708	18,908	21,546	20,732	17,032	16,269	8,749	8,095	9,569	15,773	14,327	13,927
AL	Petroleum & Related Industries	14,882	9,353	11,226	7,416	373	310	354	292	19,196	3,365	22,103	15,109
AL	Solvent Utilization	124	119	135	120	83	74	61	54	1	1	46,790	46,658
AL	Storage & Transport	65	65	51	51	870	823	653	604	2	2,767	18,726	12,302
AL	Waste Disposal & Recycling	45,712	45,712	1,876	1,876	7,885	7,885	6,531	6,531	175	175	3,620	3,620
AL	**Subtotals:**	1,822,482	1,282,309	359,823	158,113	544,216	582,273	179,106	178,853	278,365	75,834	393,464	297,303
FL	Chemical & Allied Product Mfg	117	117	1,393	1,279	415	337	348	295	21,948	14,260	1,231	1,230
FL	Fuel Comb. Elec. Util.	36,344	25,254	69,049	26,425	11,621	8,680	9,607	7,973	95,087	24,565	1,931	1,497
FL	Fuel Comb. Industrial	72,200	78,811	31,291	29,867	33,061	38,121	28,979	33,504	15,715	8,477	4,576	3,617
FL	Fuel Comb. Other	25,015	23,851	4,601	4,590	3,498	3,278	3,448	3,248	1,183	303	4,330	3,860
FL	Highway Vehicles	1,784,678	679,511	308,752	72,019	21,329	19,834	9,377	4,412	2,104	823	183,609	51,019
FL	Metals Processing	742	480	80	80	199	192	165	159	337	31	62	49
FL	Miscellaneous	992,515	960,190	22,844	21,346	384,091	466,941	129,258	138,297	10,473	9,727	231,259	228,825
FL	Off-Highway	1,120,490	1,125,776	159,796	94,782	14,009	6,737	13,181	6,231	20,051	2,973	166,582	88,560
FL	Other Industrial Processes	13,065	13,065	8,885	12,313	28,504	28,693	11,836	12,042	4,338	4,315	14,485	14,315
FL	Petroleum & Related Industries	802	828	279	293	92	93	63	64	211	211	2,847	2,252
FL	Solvent Utilization	3	3	2	2	34	33	30	30	<0.5	<0.5	151,477	151,367
FL	Storage & Transport	104	104	154	154	1,177	971	592	528	29	29	101,966	68,391
FL	Waste Disposal & Recycling	27,944	28,108	1,240	2,301	4,151	4,199	3,492	3,534	1,224	1,265	2,707	2,734
FL	**Subtotal:**	4,074,019	2,936,098	608,366	265,451	502,181	578,109	210,376	210,317	172,700	66,979	867,062	617,716

State	Tier 1 Sector	2011 CO (tpy)	2028 CO (tpy)	2011 NO_X (tpy)	2028 NO_X (tpy)	2011 PM_{10} (tpy)	2028 PM_{10} (tpy)	2011 $PM_{2.5}$ (tpy)	2028 $PM_{2.5}$ (tpy)	2011 SO_2 (tpy)	2028 SO_2 (tpy)	2011 VOC (tpy)	2028 VOC (tpy)
GA	Chemical & Allied Product Mfg	502	476	959	931	476	406	408	353	1,580	1,054	2,571	2,399
GA	Fuel Comb. Elec. Util.	13,543	10,611	56,037	25,481	9,061	5,150	6,298	4,242	188,009	18,411	1,195	1,016
GA	Fuel Comb. Industrial	21,837	19,771	22,274	17,788	3,198	2,672	2,752	2,311	21,358	9,769	1,737	1,618
GA	Fuel Comb. Other	20,021	19,536	11,233	10,857	2,204	1,998	2,152	1,950	4,660	4,187	3,056	2,730
GA	Highway Vehicles	1,018,645	305,264	223,223	48,973	12,518	8,914	6,829	2,289	1,088	443	109,005	25,629
GA	Metals Processing	344	344	149	149	156	156	82	82	92	92	57	57
GA	Miscellaneous	1,022,524	984,133	40,646	39,003	858,861	998,804	220,258	232,719	11,424	10,688	78,048	75,220
GA	Off-Highway	471,960	477,533	74,217	40,838	5,923	2,974	5,594	2,769	2,562	967	60,843	36,837
GA	Other Industrial Processes	24,548	17,280	15,893	13,130	47,506	45,021	17,925	15,808	3,705	2,268	22,763	20,583
GA	Petroleum & Related Industries	6	6	none reported	none reported	23	22	11	13	none reported	none reported	132	131
GA	Solvent Utilization	25	24	30	28	31	31	30	30	<0.5	<0.5	84,352	83,997
GA	Storage & Transport	49	49	21	21	1,015	1,014	511	502	none reported	none reported	33,985	23,439
GA	Waste Disposal & Recycling	227,703	227,696	7,636	7,628	26,852	26,851	26,222	26,221	223	222	17,363	17,361
GA	**Subtotals:**	**2,821,707**	**2,062,723**	**452,318**	**204,827**	**967,824**	**1,094,013**	**289,072**	**289,289**	**234,701**	**48,101**	**415,107**	**291,017**
KY	Chemical & Allied Product Mfg	62	62	241	241	817	816	708	708	1,663	393	2,202	2,189
KY	Fuel Comb. Elec. Util.	15,547	12,253	92,756	33,258	13,874	7,409	9,495	5,781	247,556	49,728	1,749	1,067
KY	Fuel Comb. Industrial	10,848	10,870	20,009	17,876	2,247	2,505	1,981	2,214	5,774	4,819	1,422	1,031
KY	Fuel Comb. Other	48,175	43,582	5,765	5,477	6,891	6,158	6,781	6,072	1,868	1,166	8,390	7,183
KY	Highway Vehicles	498,702	157,636	115,685	27,819	5,480	3,448	3,345	1,015	502	209	50,326	12,938
KY	Metals Processing	61,446	61,446	1,611	1,611	4,151	4,111	3,402	3,383	6,021	3,200	2,081	2,081
KY	Miscellaneous	190,510	180,432	3,486	3,034	204,775	230,661	44,517	47,310	1,742	1,528	43,514	42,725
KY	Off-Highway	201,625	193,150	56,646	29,793	3,573	1,557	3,392	1,464	641	402	31,999	17,094
KY	Other Industrial Processes	4,985	4,992	5,682	5,662	26,177	25,483	9,042	8,737	6,468	6,465	31,759	31,489
KY	Petroleum & Related Industries	31,312	67,128	24,707	47,426	683	2,795	633	2,745	522	1,561	31,085	44,846
KY	Solvent Utilization	3	3	5	5	83	81	73	72	<0.5	<0.5	44,118	44,031
KY	Storage & Transport	23	23	6	6	2,005	1,804	484	427	3	3	22,606	16,169
KY	Waste Disposal & Recycling	25,288	25,288	1,156	1,156	5,335	5,330	4,532	4,527	161	161	2,352	2,352
KY	**Subtotals:**	**1,088,526**	**756,865**	**327,755**	**173,364**	**276,091**	**292,158**	**88,385**	**84,455**	**272,921**	**69,635**	**273,603**	**225,195**

State	Tier 1 Sector	2011 CO (tpy)	2028 CO (tpy)	2011 NO_X (tpy)	2028 NO_X (tpy)	2011 PM_{10} (tpy)	2028 PM_{10} (tpy)	2011 $PM_{2.5}$ (tpy)	2028 $PM_{2.5}$ (tpy)	2011 SO_2 (tpy)	2028 SO_2 (tpy)	2011 VOC (tpy)	2028 VOC (tpy)
MS	Chemical & Allied Product Mfg	7,477	7,454	1,864	1,841	487	481	430	428	1,377	49	1,317	1,316
MS	Fuel Comb. Elec. Util.	6,154	4,172	26,602	12,229	2,084	1,457	1,627	1,120	43,259	3,237	487	416
MS	Fuel Comb. Industrial	14,794	16,135	32,381	27,363	3,448	3,458	2,935	2,820	6,397	1,631	3,428	3,253
MS	Fuel Comb. Other	7,450	7,009	2,885	2,848	1,029	967	997	935	50	50	1,200	1,056
MS	Highway Vehicles	433,332	117,589	91,026	17,788	4,491	3,100	2,538	814	405	165	46,084	9,317
MS	Metals Processing	1,313	2,021	381	1,446	549	371	546	364	124	1,366	127	156
MS	Miscellaneous	372,960	325,044	9,080	6,803	996,316	1,211,587	142,022	160,523	4,248	3,165	81,272	77,346
MS	Off-Highway	153,473	143,429	33,132	16,707	2,493	1,074	2,353	999	1,029	143	29,662	14,770
MS	Other Industrial Processes	5,127	5,046	3,204	2,591	8,129	7,605	5,372	4,901	678	652	10,915	10,632
MS	Petroleum & Related Industries	4,592	5,412	3,641	4,105	257	322	200	270	6,240	1,407	28,840	24,313
MS	Solvent Utilization	31	30	39	37	115	113	105	104	<0.5	<0.5	38,358	37,486
MS	Storage & Transport	368	368	71	71	109	103	70	66	42	42	29,068	20,947
MS	Waste Disposal & Recycling	42,760	42,760	1,591	1,591	6,657	6,657	5,392	5,392	91	91	3,780	3,843
MS	**Subtotals:**	1,049,831	676,469	205,897	95,420	1,026,164	1,237,295	164,587	178,736	63,940	11,998	274,538	204,851
NC	Chemical & Allied Product Mfg	7,188	693	1,286	879	738	1,184	472	462	5,507	5,056	2,756	3,712
NC	Fuel Comb. Elec. Util.	32,828	10,563	43,911	21,401	8,790	3,190	6,921	2,867	83,925	8,976	934	1,095
NC	Fuel Comb. Industrial	16,197	14,319	24,394	16,775	3,828	2,910	2,899	2,430	12,354	5,139	1,500	1,172
NC	Fuel Comb. Other	29,163	28,846	9,652	9,791	4,724	4,604	4,323	4,246	7,757	5,970	4,611	4,302
NC	Highway Vehicles	1,145,623	252,167	204,008	30,968	10,447	6,512	5,510	1,646	1,082	311	112,173	21,709
NC	Metals Processing	2,675	2,122	324	454	355	547	308	471	556	433	1,493	1,005
NC	Miscellaneous	101,890	86,087	4,047	3,500	195,376	221,483	45,672	49,500	1,068	956	7,851	6,672
NC	Off-Highway	479,335	471,127	68,433	39,379	5,742	2,994	5,435	2,798	2,472	1,055	63,283	37,520
NC	Other Industrial Processes	5,731	11,412	10,261	12,529	14,515	18,192	6,970	8,780	3,279	4,105	15,218	20,374
NC	Petroleum & Related Industries	773	1,007	263	305	249	295	160	263	432	412	306	354
NC	Solvent Utilization	53	79	72	103	145	177	121	165	31	8	95,419	110,199
NC	Storage & Transport	2,174	278	125	128	590	654	306	412	7	11	24,731	15,117
NC	Waste Disposal & Recycling	66,928	67,028	2,720	2,772	11,151	11,153	9,386	9,420	251	213	5,613	5,800
NC	**Subtotals:**	1,890,558	945,728	369,496	138,984	256,650	273,895	88,483	83,460	118,721	32,645	335,888	229,031

State	Tier 1 Sector	2011 CO (tpy)	2028 CO (tpy)	2011 NO_X (tpy)	2028 NO_X (tpy)	2011 PM_{10} (tpy)	2028 PM_{10} (tpy)	2011 $PM_{2.5}$ (tpy)	2028 $PM_{2.5}$ (tpy)	2011 SO_2 (tpy)	2028 SO_2 (tpy)	2011 VOC (tpy)	2028 VOC (tpy)
SC	Chemical & Allied Product Mfg	1,217	1,217	165	165	132	131	77	76	9	4	2,110	1,843
SC	Fuel Comb. Elec. Util.	16,809	13,527	26,752	10,993	10,851	3,290	8,604	2,672	71,899	10,762	607	573
SC	Fuel Comb. Industrial	19,560	21,191	17,924	17,505	10,314	11,286	8,273	9,498	15,748	9,386	1,103	1,117
SC	Fuel Comb. Other	12,508	11,800	3,283	3,351	1,701	1,580	1,660	1,546	339	309	2,128	1,867
SC	Highway Vehicles	475,876	155,913	109,374	23,263	6,618	4,504	3,766	1,152	504	215	51,164	12,546
SC	Metals Processing	53,733	53,811	780	861	572	581	480	489	5,139	5,182	457	457
SC	Miscellaneous	214,147	200,969	4,602	4,033	280,281	341,123	51,363	56,686	1,978	1,902	48,908	47,771
SC	Off-Highway	240,507	233,340	35,569	19,154	3,036	1,477	2,856	1,369	2,268	360	35,104	19,097
SC	Other Industrial Processes	17,912	17,827	10,251	11,697	7,581	7,311	4,149	3,897	5,223	5,724	15,036	14,754
SC	Petroleum & Related Industries	none reported	none reported	none reported	none reported	none reported	none reported	none reported	none reported	none reported	none reported	31	29
SC	Solvent Utilization	7	7	1	1	14	14	13	12	<0.5	<0.5	41,039	39,341
SC	Storage & Transport	39	39	26	26	346	282	139	119	1	1	30,397	21,258
SC	Waste Disposal & Recycling	48,668	48,667	1,817	1,806	7,055	7,042	5,746	5,735	140	139	4,073	4,059
SC	**Subtotals:**	1,100,983	758,308	210,544	92,855	328,501	378,621	87,126	83,251	103,248	33,984	232,157	164,712
TN	Chemical & Allied Product Mfg	14,866	14,862	811	804	755	755	426	426	492	489	4,412	4,397
TN	Fuel Comb. Elec. Util.	5,529	3,771	27,156	8,006	5,191	2,618	4,172	2,444	120,170	10,059	769	585
TN	Fuel Comb. Industrial	18,910	22,671	27,988	25,234	10,632	12,293	9,018	10,691	27,778	8,076	1,129	1,239
TN	Fuel Comb. Other	25,945	23,479	9,207	8,441	3,470	3,044	3,182	2,928	5,441	779	5,168	4,906
TN	Highway Vehicles	739,041	233,423	182,796	44,927	9,927	6,734	5,778	1,811	769	338	80,463	20,483
TN	Metals Processing	5,066	5,066	611	611	1,492	1,492	1,251	1,251	572	681	2,923	2,923
TN	Miscellaneous	133,301	124,792	2,840	2,450	150,164	165,066	36,986	39,404	1,347	1,162	31,052	30,344
TN	Off-Highway	309,062	298,569	60,384	33,596	4,242	2,032	4,010	1,898	767	625	46,292	25,501
TN	Other Industrial Processes	5,668	6,244	7,449	8,189	11,527	11,224	6,034	5,779	2,550	1,468	15,672	14,828
TN	Petroleum & Related Industries	2,706	4,956	1,812	3,193	189	307	160	278	243	149	3,559	3,517
TN	Solvent Utilization	72	72	84	84	328	328	288	288	15	15	67,091	67,091
TN	Storage & Transport	56	56	37	29	520	393	238	184	5	4	29,921	19,812
TN	Waste Disposal & Recycling	26,959	26,959	1,392	1,392	5,710	5,710	4,813	4,813	174	137	2,549	2,839
TN	**Subtotals:**	1,287,181	764,920	322,567	136,956	204,147	211,996	76,356	72,195	160,323	23,982	291,000	198,465

State	Tier 1 Sector	2011 CO (tpy)	2028 CO (tpy)	2011 NO_X (tpy)	2028 NO_X (tpy)	2011 PM_{10} (tpy)	2028 PM_{10} (tpy)	2011 $PM_{2.5}$ (tpy)	2028 $PM_{2.5}$ (tpy)	2011 SO_2 (tpy)	2028 SO_2 (tpy)	2011 VOC (tpy)	2028 VOC (tpy)
VA	Chemical & Allied Product Mfg	83	83	7,707	1,734	169	169	73	73	203	203	486	485
VA	Fuel Comb. Elec. Util.	4,984	6,232	30,213	10,677	5,794	3,858	1,157	1,456	69,077	1,903	742	448
VA	Fuel Comb. Industrial	13,713	11,294	22,048	13,962	5,883	5,071	4,817	4,376	14,349	5,776	950	871
VA	Fuel Comb. Other	77,919	74,900	11,470	11,034	11,302	10,748	11,002	10,507	4,884	3,264	12,940	11,877
VA	Highway Vehicles	566,315	232,611	145,507	35,427	7,106	4,302	4,368	1,309	711	279	63,152	18,550
VA	Metals Processing	3,016	3,016	812	812	859	858	724	723	5,196	5,196	270	270
VA	Miscellaneous	167,730	164,877	3,186	3,077	141,777	156,214	33,384	36,128	1,487	1,439	39,308	39,107
VA	Off-Highway	383,506	391,290	67,844	37,836	5,029	2,576	4,747	2,398	3,355	892	48,417	30,266
VA	Other Industrial Processes	5,644	7,256	12,766	10,337	12,394	12,839	5,001	5,400	7,028	5,294	6,937	7,107
VA	Petroleum & Related Industries	12,445	12,993	9,618	9,748	406	541	284	424	59	65	8,525	12,152
VA	Solvent Utilization	<0.5	0	<0.5	0	66	68	61	63	<0.5	<0.5	85,760	93,969
VA	Storage & Transport	5	6	2	2	351	353	286	301	<0.5	<0.5	23,556	16,224
VA	Waste Disposal & Recycling	33,103	33,192	2,283	2,305	5,745	5,758	4,925	4,932	1,469	1,483	4,317	4,380
VA	**Subtotals:**	1,268,463	937,750	313,456	136,951	196,881	203,355	70,829	68,090	107,818	25,794	295,360	235,706
WV	Chemical & Allied Product Mfg	247	249	402	278	330	296	246	229	145	106	2,000	1,036
WV	Fuel Comb. Elec. Util.	10,106	8,663	54,289	49,885	11,066	6,822	9,100	5,462	93,080	47,746	1,011	1,162
WV	Fuel Comb. Industrial	4,424	3,896	16,592	10,820	1,977	1,291	1,086	492	16,306	6,241	540	581
WV	Fuel Comb. Other	19,471	18,115	8,661	6,695	2,893	2,751	2,803	2,671	760	677	4,059	3,472
WV	Highway Vehicles	185,437	55,258	41,840	10,124	2,101	1,273	1,269	375	179	72	20,493	5,208
WV	Metals Processing	24,179	24,088	1,806	1,839	1,468	1,362	1,046	973	2,069	1,956	520	499
WV	Miscellaneous	86,791	86,171	1,296	1,277	76,122	76,051	15,876	15,810	684	677	20,396	20,356
WV	Off-Highway	89,194	89,372	22,397	11,934	1,428	696	1,341	649	204	35	15,934	8,932
WV	Other Industrial Processes	2,726	2,616	2,464	1,941	21,016	20,439	3,655	3,664	1,983	1,350	1,283	1,443
WV	Petroleum & Related Industries	27,645	42,008	22,041	29,242	692	1,514	594	1,511	6,144	191	47,734	130,121
WV	Solvent Utilization	<0.5	<0.5	<0.5	none reported	13	2	13	2	<0.5	none reported	14,315	13,610
WV	Storage & Transport	2	2	4	21	465	220	182	74	<0.5	<0.5	8,621	5,687
WV	Waste Disposal & Recycling	31,785	31,786	1,152	1,152	4,840	4,840	3,981	3,981	63	63	2,622	2,606
WV	**Subtotals:**	482,007	362,224	172,944	125,208	124,411	117,557	41,192	35,893	121,617	59,114	139,528	194,713
VISTAS	**Totals:**	16,885,757	11,483,394	3,343,166	1,528,129	4,427,066	4,969,272	1,295,512	1,284,539	1,634,354	448,066	3,517,707	2,658,709

7.2.5. EPA Inventories

EPA created a 2016 base year emissions inventory for modeling purposes in a collaborative effort with states and RPOs. The 2016 emissions inventory data for the point source and EGU sectors originated with state submissions to the EIS and, for those units subject to 40 CFR Part 75 monitoring requirements, unit level reporting to CAMD. Other source sector data were estimated by EPA, through emissions inventory tools, or estimates based upon state supplied input. This data set includes a full suite of 2016 base year inventories and projection year data for 2023 and 2028, referred to as 2016fh, 2023fh, and 2028fh.[43] The 2023 and 2028 projections from 2016 relied upon IPM for estimates of EGU activity and emissions. EPA has provided emission summaries of this information at state and SCC levels for both the 2016 base year and EPA's previous 2014 base year. EPA used the 2014 NEI data to create the 2014 base year data set, referred to as 2014fd.[44] Point source and EGU sector information for the 2014 NEI originated with state submissions or from unit level reporting to CAMD. Other sectors in the 2014 NEI were created by EPA based on tool inputs supplied by state staff, contractor estimates, and additional sources. Evaluation of these data sets show trends that are similar to those in the VISTAS emissions inventory.

EPA has also prepared and published the 2017 NEI[45] based on point source and EGU sector data that originated with state EIS submissions or unit level reporting to CAMD. EPA developed other emissions sectors of the 2017 NEI using state-supplied input files for emission estimation tools, contractor estimates, and additional sources of data. These data represent the January 2021 version of this database, which includes all sectors and pollutants for emissions across the United States.

Figure 7-5 provides the estimated actual SO_2 emissions within the EPA inventories for 2014, 2016, and 2017 by Tier 1 category within the ten VISTAS states; the emissions inventories for years 2023 and 2028, projected from the base year 2016 data by EPA; and the 2011 and 2028 VISTAS inventories used in the RPG modeling. The 2011 and 2014 data show that SO_2 emissions were predominantly emitted from electric utility fuel combustion and industrial fuel combustion within the VISTAS region. Significant SO_2 reductions occurred by 2016, and additional reductions occurred in 2017. These SO_2 reductions are most pronounced in the electric utility fuel combustion category. EPA's 2023 and 2028 data forecast continued declines in SO_2 emissions from this category. The VISTAS 2028 data also project additional SO_2 emission

[43] In these abbreviations, the numbers are the year represented by the emissions; the "f" represents the base year platform iteration, in this case the 2014-based modeling platform; and "h" stands for the eighth set of emissions modeled for a 2014-based modeling platform. URL: https://www.epa.gov/air-emissions-modeling/2016v1-platform
[44] In this abbreviation, the number is the year represented by the emissions; the "f" represents the base year platform iteration, in this case the 2014-based modeling platform; and "d" stands for the fourth set of emissions modeled for a 2014-based modeling platform. URL: https://www.epa.gov/air-emissions-modeling/2014-version-71-platform
[45] URL: https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data

reductions across the VISTAS states although these projections are higher than the EPA 2028 projections.

Figure 7-6 provides the estimated actual NO_X emissions within the EPA inventories for 2014, 2016, and 2017 by Tier 1 category within the ten VISTAS states; the emissions inventories for years 2023 and 2028, projected from the base year 2016 data by EPA; and the 2011 and 2028 VISTAS inventories used in the RPG modeling. The 2011, 2014, and 2016 data show that NO_X emissions were predominantly emitted from onroad and off-highway source sectors. Significant reductions in NO_X occurred by 2016 as compared to 2011. During this time period reductions in emissions from onroad and off-highway source sectors as well as the electrical utility fuel combustion sector contributed to this drop. EPA's 2023 and 2028 projections forecast continued declines in NO_X emissions, most notably from the onroad and off-highway source sectors. The VISTAS 2028 data also project additional NO_X emission reductions across the VISTAS states although the estimated reductions are not as great as those from EPA.

The VISTAS 2028 data is higher than the EPA 2028 projections largely due to differences in projection methodologies for EGUs and some non-EGUs. For example, EPA relied upon IPM results that generally have lower SO_2 and NO_X emissions than ERTAC results. The IPM tool may retire or idle coal fired EGUs and certain coal fired industrial boilers that occasionally provide electricity to the grid due to economic assumptions within the model. ERTAC projections does not use economic decisions to forecast retirements or idling of units in future years. Rather, states provide estimated retirement dates based on information provided by the facility owners, consent decrees, permits, or other types of documentation. The ERTAC projections, therefore, tend to be more conservative.

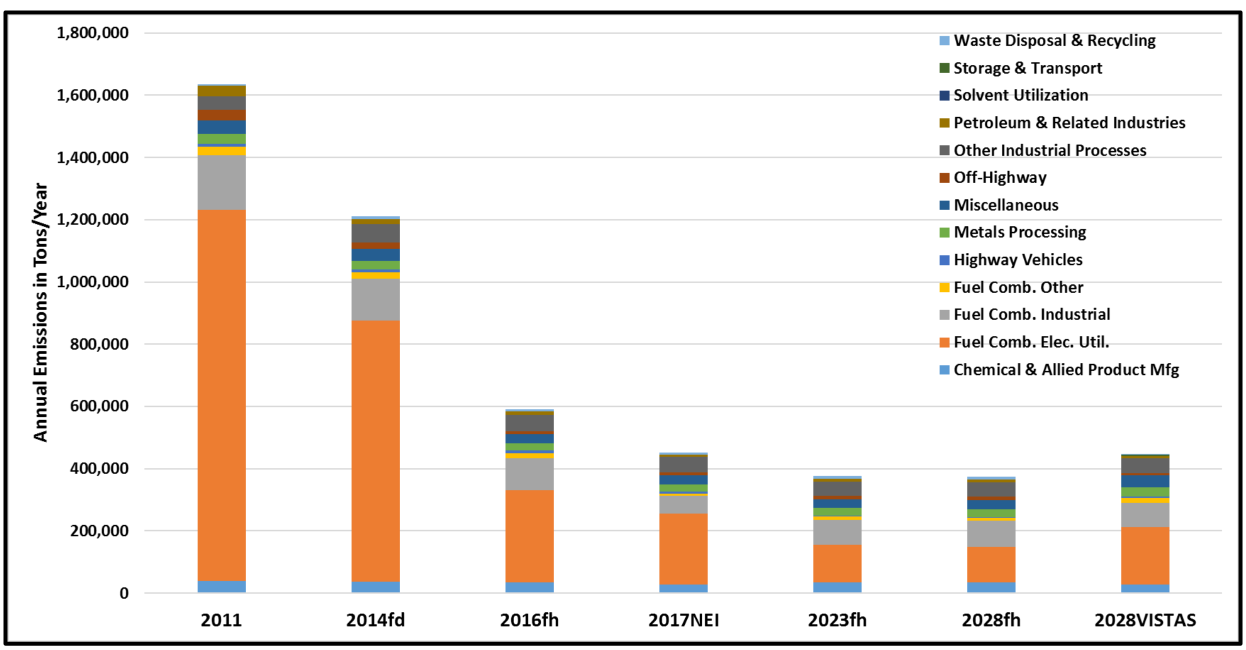


Figure 7-5: SO_2 Emissions from VISTAS States

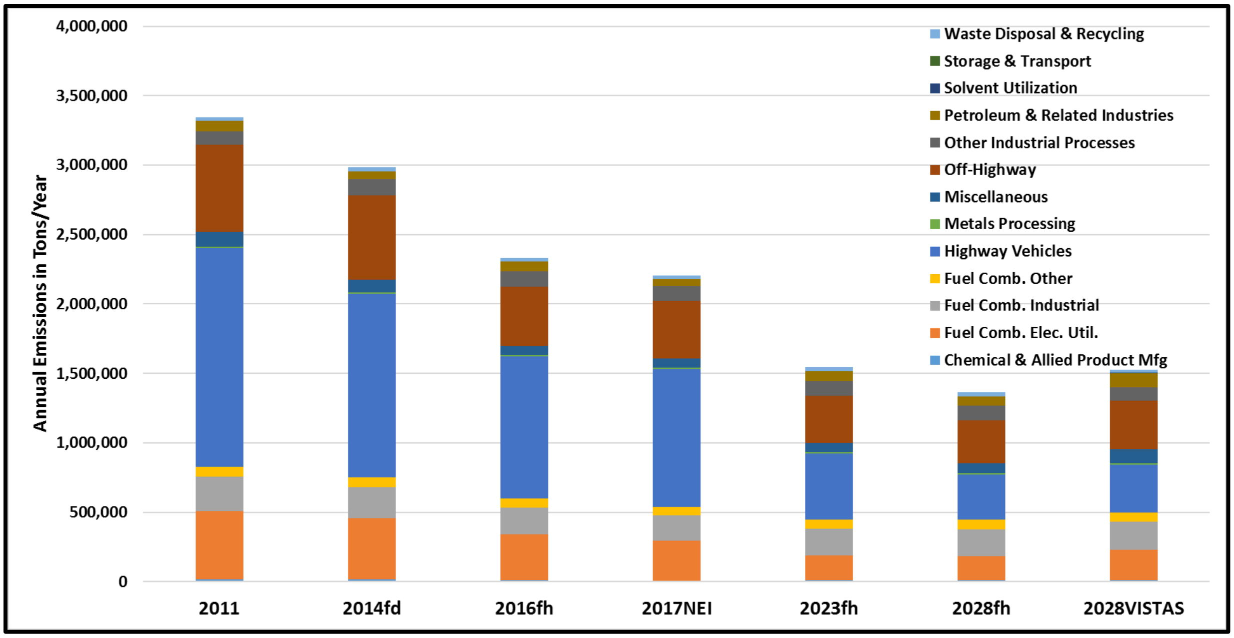


Figure 7-6: NO_X Emissions from VISTAS States

The data for Florida in the EPA inventories also forecast significant declines in both SO_2 and NO_X emissions. Figure 7-7 provides EPA's estimates of Florida's actual SO_2 emissions from 2011, 2014, 2016, and 2017 as well as EPA's projected values for 2023 and 2028 and the VISTAS projected value for 2028. EPA estimated just under 173,000 tons of SO_2 emissions from Florida in 2011. EPA expects that SO_2 emissions in Florida will drop to just under 60,000 tons by 2028, a 65% reduction. The VISTAS projection for Florida shows that emissions of SO_2 should drop to just under 67,000 tons by 2028, a 61% reduction.

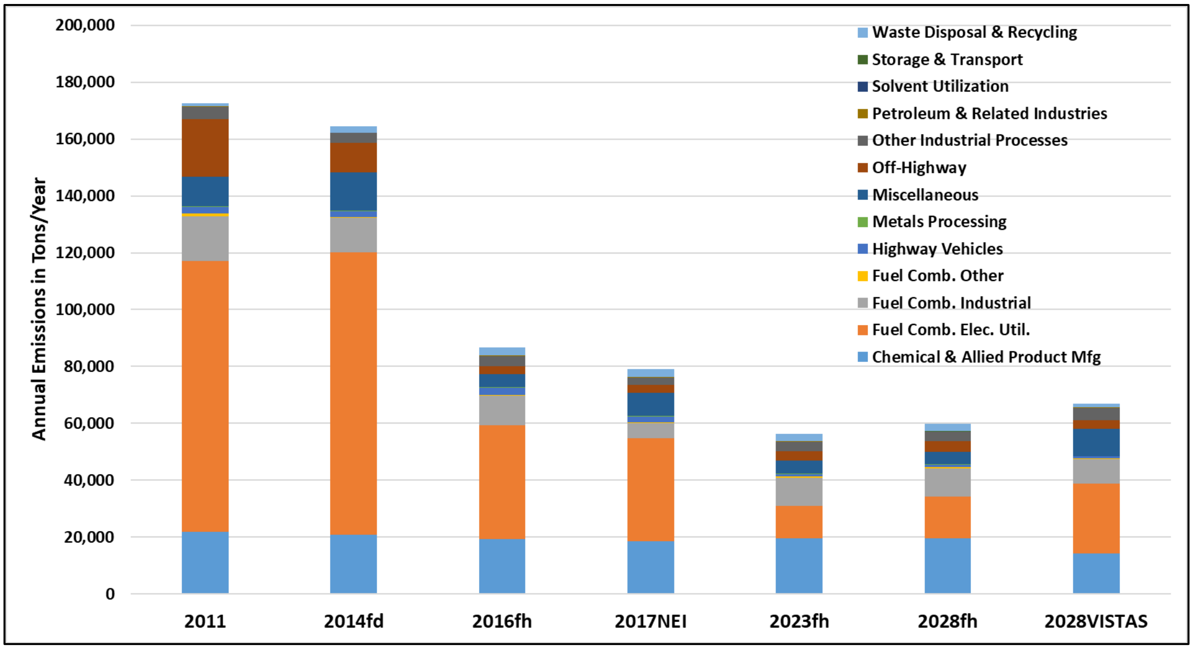


Figure 7-7: Florida SO_2 Emissions

Figure 7-8 provides EPA's estimates of actual NO_X emissions in Florida from 2011, 2014, 2016, and 2017. The figure also shows EPA's projected values for 2023 and 2028, using 2016 as the base year, and the VISTAS projections for 2028. EPA estimated about 608,000 tons of NO_X emissions from Florida in 2011. EPA expects that NO_X emissions in Florida will drop to under 236,000 tons by 2028, a 61% reduction. The VISTAS projections estimate that Florida NO_X emissions will drop to about 265,000 tons by 2028, a 56% reduction.

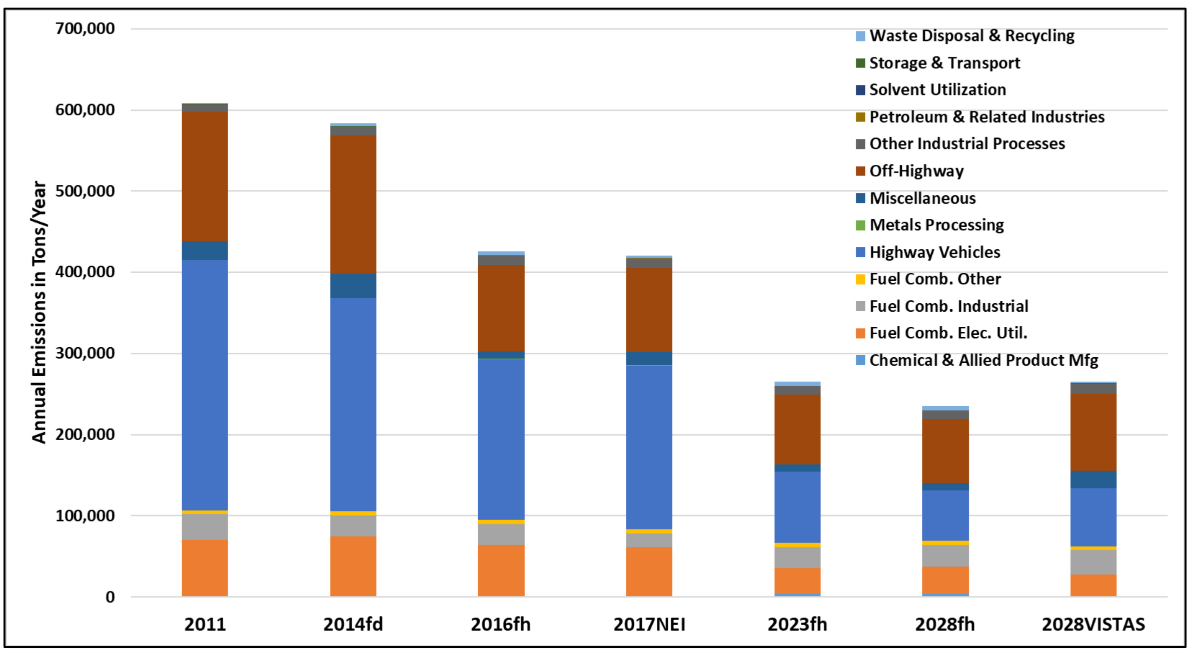


Figure 7-8: Florida NO_X Emissions

The VISTAS 2028 projections do not include reductions from programs noted in Section 8.2 so that the estimates are likely conservative and actual 2028 emissions of SO_2 and NO_X should be lower than those noted.

7.2.6. VISTAS 2028 Model Projections

VISTAS states used emissions modeling, as described in Section 5 and Section 6, to project visibility in 2028 using a 2028 emissions inventory as described in Section 4. The EPA Software for Model Attainment Test – Community Edition (SMAT-CE) tool was used to calculate 2028 deciview values on the 20% most impaired and 20% clearest days at each Class I area IMPROVE monitoring site. SMAT-CE[46] is an EPA software tool that implements the procedures in the "Modeling Guidance for Demonstrating Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze," (SIP modeling guidance)[47] to project visibility in the future year. The SMAT-CE tool outputs individual year and five-year average base year and future year deciview values on the 20% most impaired days and the 20% clearest days.

7.2.6.1. Calculation of 2028 Visibility Estimates

The visibility projections follow the procedures in Section 5 of the SIP modeling guidance. Based on recommendations in the SIP modeling guidance, the observed base period visibility data is linked to the modeling base period. In this case, for a base modeling year of 2011, the 2009-2013 IMPROVE data for the 20% most impaired days and 20% clearest days were used as the basis for the 2028 projections. Section 2.5 discusses the IMPROVE monitoring data during the modeling base period of 2009-2013.

The visibility calculations use the IMPROVE equation discussed in Section 2.1. As noted in Section 2.1, the IMPROVE algorithm uses PM species concentrations and relative humidity data to calculate visibility impairment as extinction (b_{ext}) in units of inverse megameters.

The 2028 future year visibility on the 20% most impaired days and the 20% clearest days at each Class I area is estimated by using the observed IMPROVE data from years 2009-2013 and the relative percent modeled change in PM species between 2011 and 2028. The following steps describe the process. The SIP modeling guidance contains more detailed description and examples.

- Step 1 - For each Class I area (i.e., IMPROVE site), estimate anthropogenic impairment (Mm^{-1}) on each day using observed speciated $PM_{2.5}$ data plus PM_{10} data (and other information) for each of the five years comprising the modeling base period (2009-2013)

[46] URL: https://www.epa.gov/scram/photochemical-modeling-tools
[47] URL: https://www.epa.gov/sites/production/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

and rank the days on this indicator.[48] This ranking will determine the 20% most impaired days. For each Class I area, also rank observed visibility (in deciviews) on each day using observed speciated $PM_{2.5}$ data plus PM_{10} data for each of the five years comprising the modeling base period. This ranking will determine the 20% clearest days.

- Step 2 - For each of the five years comprising the base period, calculate the mean deciviews for the 20% most impaired days and the 20% clearest days. For each Class I area, calculate the five-year mean deciviews for the 20% most impaired and the 20% clearest days from the five year-specific values.

- Step 3 - Use an air quality model to simulate air quality with base period (2011) emissions and future year (2028) emissions. Use the resulting information to develop monitor site-specific relative response factors (RRFs) for each component of PM identified in the "revised" IMPROVE equation. The RRFs are an average percent change in species concentrations based on the measured 20% most impaired days and 20% clearest days from 2011 to 2028. The calendar days from 2011 identified from the IMPROVE data above are matched by day to the modeled days. RRFs are calculated separately for sulfate, nitrate, organic carbon mass, elemental carbon, fine soil mass, and coarse mass. The observed sea salt is primarily from natural sources that are not expected to be year-sensitive, and the modeled sea salt is uncertain. Therefore, the sea salt RRF for all monitor sites is assumed to be 1.0.

- Step 4 – For each monitor site, multiply the species-specific RRFs by the measured daily species concentration data during the 2009-2013 base period for each day in the measured 20% most impaired day data set and each day in the 20% clearest day data set. This results in daily future year 2028 PM species concentration data.

- Step 5 - Using the results in Step 4 and the IMPROVE algorithm described in Section 2.1, calculate the future daily extinction coefficients for the previously identified 20% most impaired days and 20% clearest days in each of the five base years.

- Step 6 - Calculate daily deciview values (from total daily extinction) and then compute the future year (2028) average mean deciviews for the 20% most impaired days and 20% clearest days for each year. Average the five years together to get the final future mean deciview values for the 20% most impaired days and 20% clearest days.

In cases where an IMPROVE monitor is located within a Class I area, the five-year average modeling base period visibility is used with modeled concentrations from the grid cell containing

[48] EPA, "Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program", December 2018. URL: https://www.epa.gov/sites/production/files/2018-12/documents/technical_guidance_tracking_visibility_progress.pdf

the Class I area to calculate future year RRFs and visibility results. In cases within VISTAS states where an IMPROVE monitor is not located within a Class I Area, surrogate IMPROVE monitors are assigned to establish modeling base period visibility values. See Section 2.2 for a description and listing of these sites. When using a surrogate IMPROVE monitor site, the five-year average modeling base period visibility from the surrogate location is used with modeled concentrations from the actual modeled grid cell at the centroid of the Class I area to calculate future year RRFs and visibility results. In Class I areas outside of the VISTAS states, surrogate monitor modeling base period data and RRFs are used to project future year visibility.

7.2.6.2. 2028 Visibility Projection Results

Table 7-2 provides the 2028 visibility projections for VISTAS Class I areas and nearby Class I areas. As discussed in Section 6.6, Florida is relying on EPA's modeling projections for Everglades. More information on the VISTAS modeling projections may be found in Appendix E-6. More information on EPA's modeling projections may be found in EPA's regional haze modeling TSD.[49]

Table 7-2: 2028 Visibility Projections for VISTAS and Nearby Class I Areas

Class I Area	Site ID	State	2028 20% Clearest Days dv)	2028 20% Clearest Days (Mm^{-1})	2028 20% Most Impaired Days (dv)	2028 20% Most Impaired Days (Mm^{-1})
Cape Romain Wilderness Area	ROMA1	SC	12.11	33.87	16.64	53.81
Chassahowitzka Wilderness Area	CHAS1	FL	12.54	35.28	16.79	54.50
Cohutta Wilderness Area	COHU1	GA	9.15	25.51	14.90	45.63
Dolly Sods Wilderness Area	DOSO1	WV	7.55	21.79	15.29	47.82
Everglades National Park*	EVER1	FL	9.88	26.86	13.95	40.35
Great Smoky Mountains National Park	GRSM1	TN	8.96	25.02	15.03	46.08
James River Face Wilderness Area	JARI1	VA	9.80	27.13	15.87	50.46
Joyce Kilmer-Slickrock Wilderness Area	GRSM1	TN	8.97	25.02	14.88	45.36
Linville Gorge Wilderness Area	LIGO1	NC	8.21	23.06	14.25	42.61
Mammoth Cave National Park	MACA1	KY	11.66	32.50	19.27	70.87
Okefenokee Wilderness Area	OKEF1	GA	11.58	32.14	16.90	55.59
Otter Creek Wilderness Area	DOSO1	WV	7.55	21.80	15.26	47.66
Shenandoah National Park	SHEN1	VA	7.27	21.20	14.47	44.02
Shining Rock Wilderness Area	SHRO1	NC	4.54	15.74	13.31	37.86
Sipsey Wilderness Area	SIPS1	AL	11.11	30.75	16.62	54.13
St. Marks Wilderness Area	SAMA1	FL	11.59	32.18	16.43	53.05
Swanquarter Wilderness Area	SWAN1	NC	10.77	29.61	15.27	47.42
Wolf Island Wilderness Area	OKEF1	GA	11.55	32.05	16.75	54.71
Breton Wilderness Area	BRIS1	LA	12.13	34.21	18.39	65.06
Brigantine Wilderness Area	BRIG1	NJ	11.07	30.54	18.40	65.20

[49] Availability of Modeling Data and Associated Technical Support Document for the EPA's Updated 2028 Visibility Air Quality Modeling. Richard A. Wayland Memorandum, U.S. EPA OAQPS. September 19, 2019. Available at https://www.epa.gov/sites/production/files/2019-10/documents/updated_2028_regional_haze_modeling-tsd-2019_0.pdf

Class I Area	Site ID	State	2028 20% Clearest Days dv)	2028 20% Clearest Days (Mm^{-1})	2028 20% Most Impaired Days (dv)	2028 20% Most Impaired Days (Mm^{-1})
Caney Creek Wilderness Area	CACR1	AR	8.79	24.75	18.32	64.25
Hercules Glade Wilderness Area	HEGL1	MO	9.75	26.88	18.80	67.92
Mingo Wilderness Area	MING1	MO	11.14	30.87	19.69	74.03
Upper Buffalo Wilderness Area	UPBU1	AR	8.93	25.07	17.82	60.73

*As discussed in Section 6.6, Florida is relying on EPA's modeling projections for Everglades.

7.2.7. Model Results for the VISTAS 2028 Inventory Compared to the URP Glide Paths for Florida Class I Areas

Using 2000 through 2004 IMPROVE monitoring data, the dv values for the 20% clearest days in each year were averaged together, producing a single average dv value for the clearest days during that time period. Similarly, the dv values for the 20% most impaired days in each year were averaged together, producing a single average dv value for the days with the most anthropogenic visibility impairment during that time period. These values form the base line for visibility at each Class I area and are used to gauge improvements. In this second round of visibility planning, 2011 represents the base year for air quality modeling projections. To develop an average 2011 impairment suitable for use in air quality projections, 2009 through 2013 IMPROVE monitoring data were used. The dv values for the 20% clearest days in each year are averaged together to produce a single average dv value for the clearest days. The 20% most impaired days were also averaged from this timeframe to produce a single value for the 20% most impaired days.

Figure 7-9, Figure 7-10, and Figure 7-11 illustrate the predicted visibility improvement on the 20% most impaired days by 2028, compared to the URP glide paths for Chassahowitzka, St. Marks, and Everglades, respectively. The pink lines represent the URP at each Class I area. The URP starts at the 2000-2004 average of the 20% most impaired days and ends in 2064 at the estimated natural condition value for each Class I area. This line shows a uniform, linear progression between the 2000-2004 baseline and the target natural condition in 2064. The model projections shown in blue triangles start at 2011 (the observed 2009-2013 average of the visibility on the 20% most impaired days) and end at the 2028 projected visibility values for the 20% most impaired days based on existing and planned emissions controls during the period of the long-term strategy associated with this round of planning. Blue diamonds on these figures represent IMPROVE monitoring data on the 20% most impaired days at each Class I area, and the brown lines denote the five-year rolling average of each set of IMPROVE monitoring data.

At Chassahowitzka and St. Marks, VISTAS modeling shows that visibility improvements on the 20% most impaired days are expected to be significantly better than the uniform rate of progress glide path by 2028. Figure 7-11 includes the 2028 projected visibility for Everglades from both the VISTAS and EPA regional haze modeling for comparison. As discussed in Section 6.6, Florida is relying on EPA's modeling for Everglades. EPA's modeling shows that visibility improvements on the 20% most impaired days at Everglades are also expected to be significantly better than the uniform rate of progress glide path by 2028.

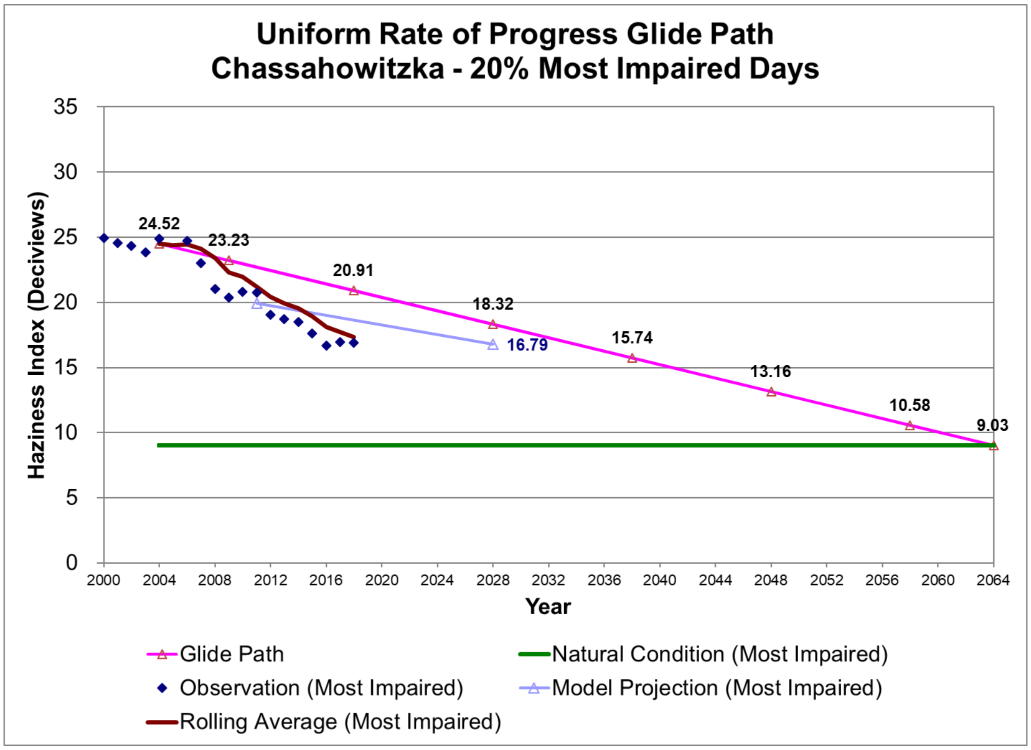


Figure 7-9: Chassahowitzka URP on the 20% Most Impaired Days

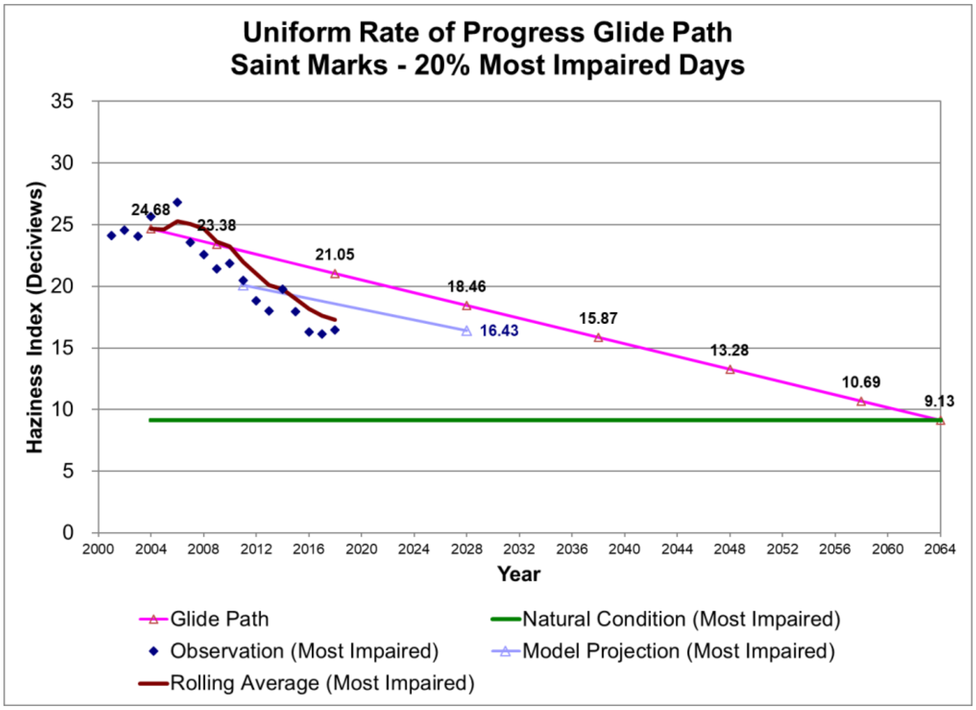


Figure 7-10: St. Marks URP on the 20% Most Impaired Days

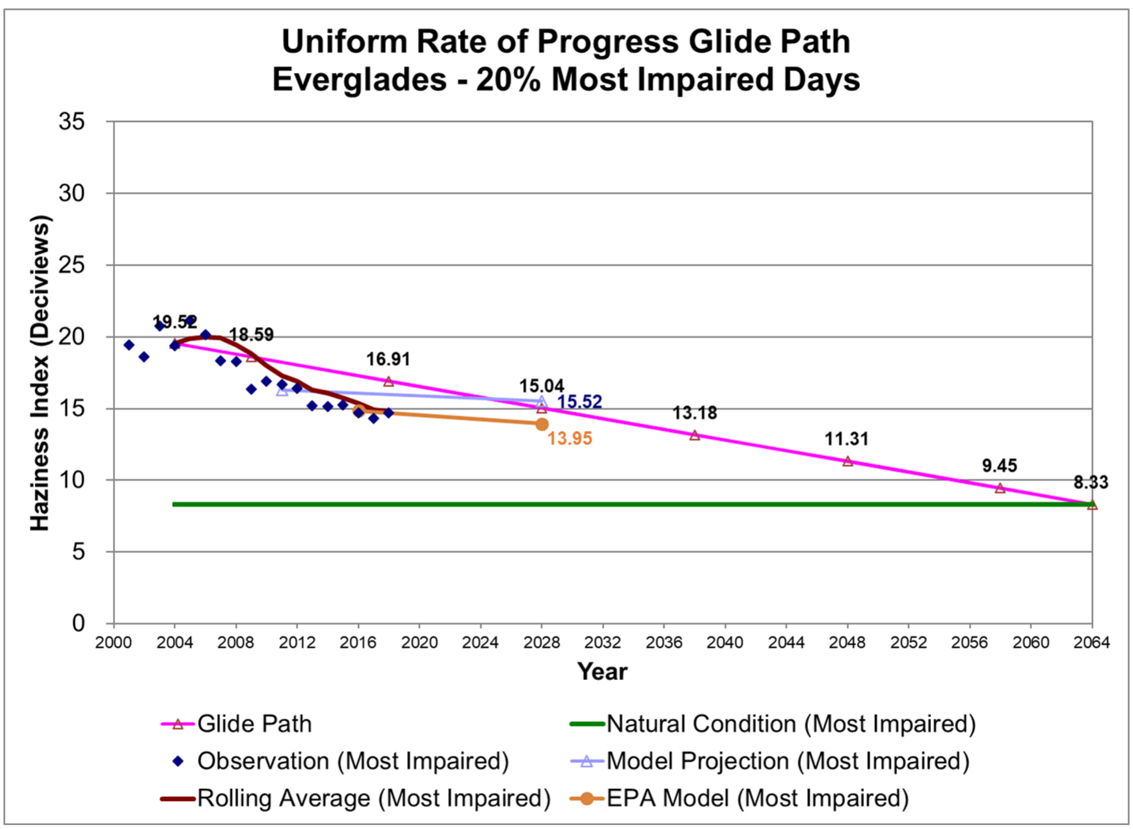
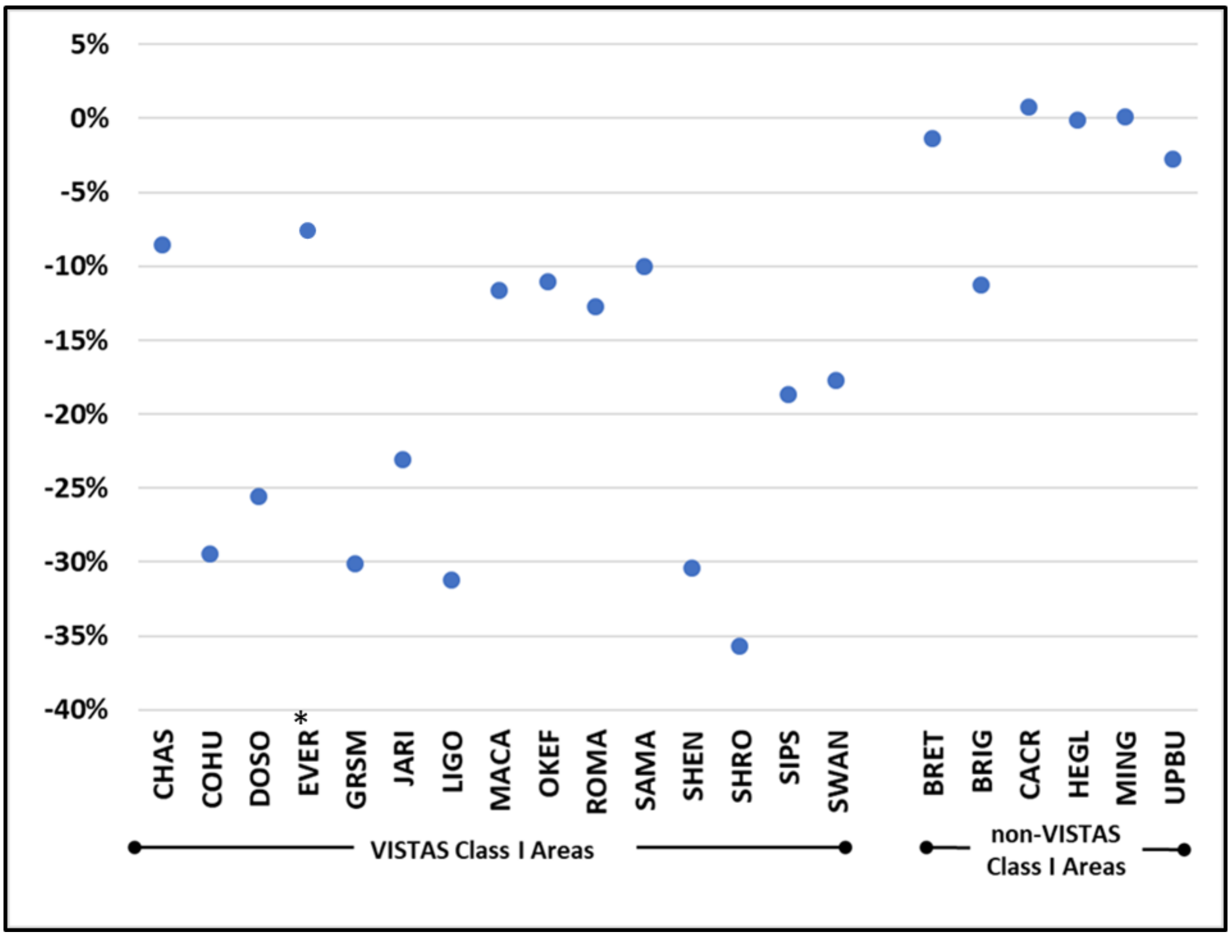


Figure 7-11: Everglades URP on the 20% Most Impaired Days with EPA Model Projection

As illustrated in Figure 7-12, the percentage displayed represents the difference between the 2028 projected visibility value from the EPA modeling analysis for Everglades and the VISTAS modeling analyses for all other Class I areas and the expected visibility improvement by 2028 on the URP. Because this calculation is based on the level of haze in dv, negative percentages indicate that the 2028 projected visibility value is better than the expected visibility by 2028 on the URP while positive percentages indicate that the 2028 projected visibility value is worse than the expected visibility by 2028 on the URP. Haze in Chassahowitzka is projected to be 8.6% better than the expected visibility for 2028 on the URP. For St. Marks, haze is projected to be 10% better than the expected visibility for 2028 on the URP. For Everglades, haze is projected to be 7.4% better than the expected visibility for 2028 on the URP. For these areas, visibility improvements are well ahead of the timeline noted on the URP.



*As discussed in Section 6.6, Florida is relying on EPA's modeling for Everglades.

Figure 7-12: Percent of URP in 2028

In addition to improving visibility on the 20% most impaired visibility days, states are also required to protect visibility on the 20% clearest days at the Class I areas to ensure no degradation of visibility on these clearest days occurs. Figure 7-13, Figure 7-14, and Figure 7-15 show the improvements expected on the 20% clearest visibility days using the VISTAS emissions inventory and associated reductions. The green line represents the 2000-2004 average baseline conditions for the 20% clearest days. The model projections shown in blue triangles start at 2011 (the observed 2009-2013 average of the visibility on the 20% clearest days) and end at the 2028 projected visibility values for the 20% clearest days based on existing and planned emissions controls during the period of the long-term strategy associated with this round of planning. The blue diamonds depict IMPROVE monitoring data values, and the gray lines denote IMPROVE monitoring data five-year averages. As noted in these figures, visibility conditions in 2028 on the 20% clearest visibility days are expected to continue to improve at all three Class I areas.

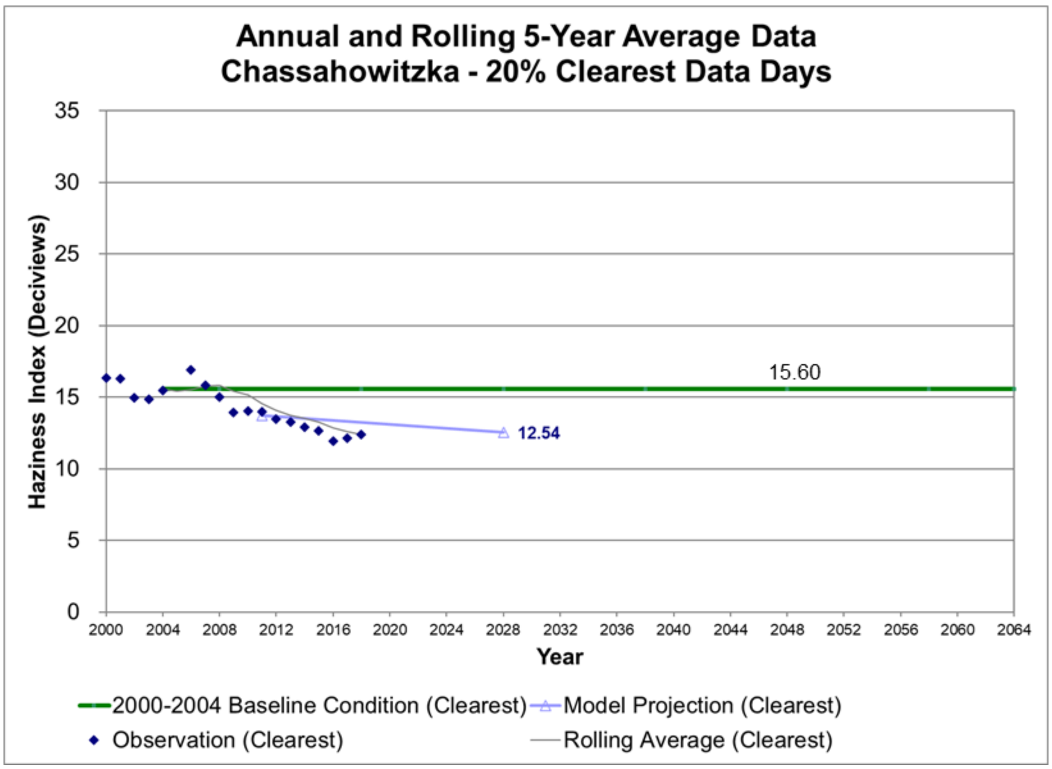


Figure 7-13: 20% Clearest Days Rate of Progress for Chassahowitzka

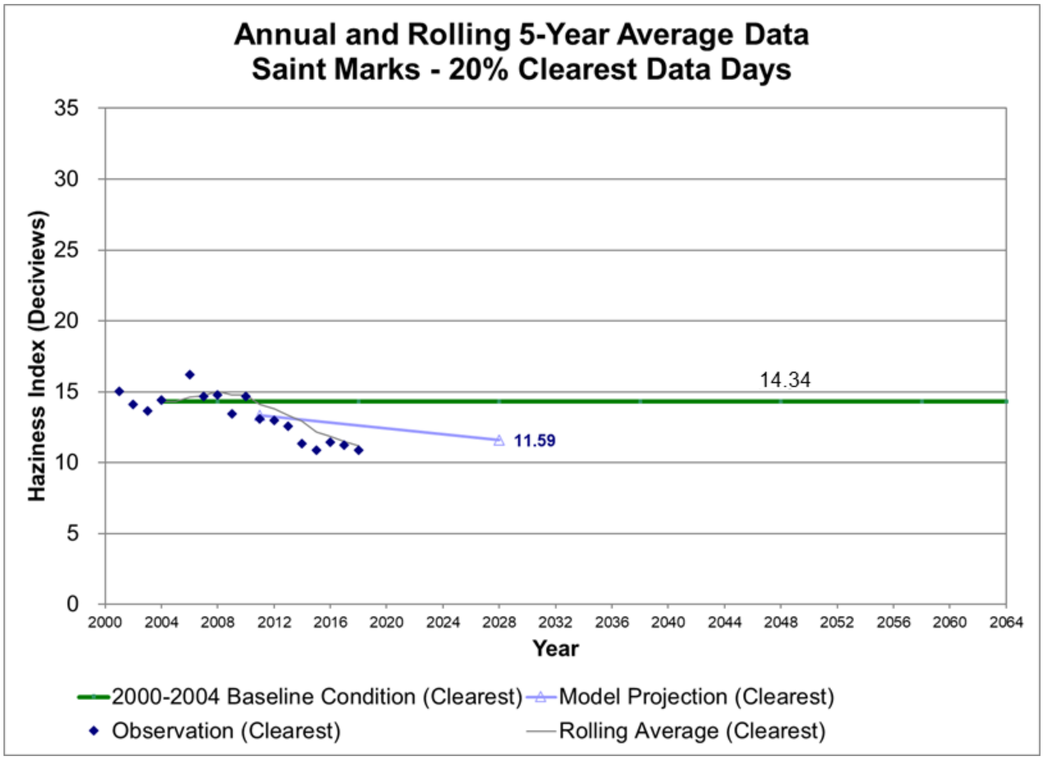


Figure 7-14: 20% Clearest Days Rate of Progress for St. Marks

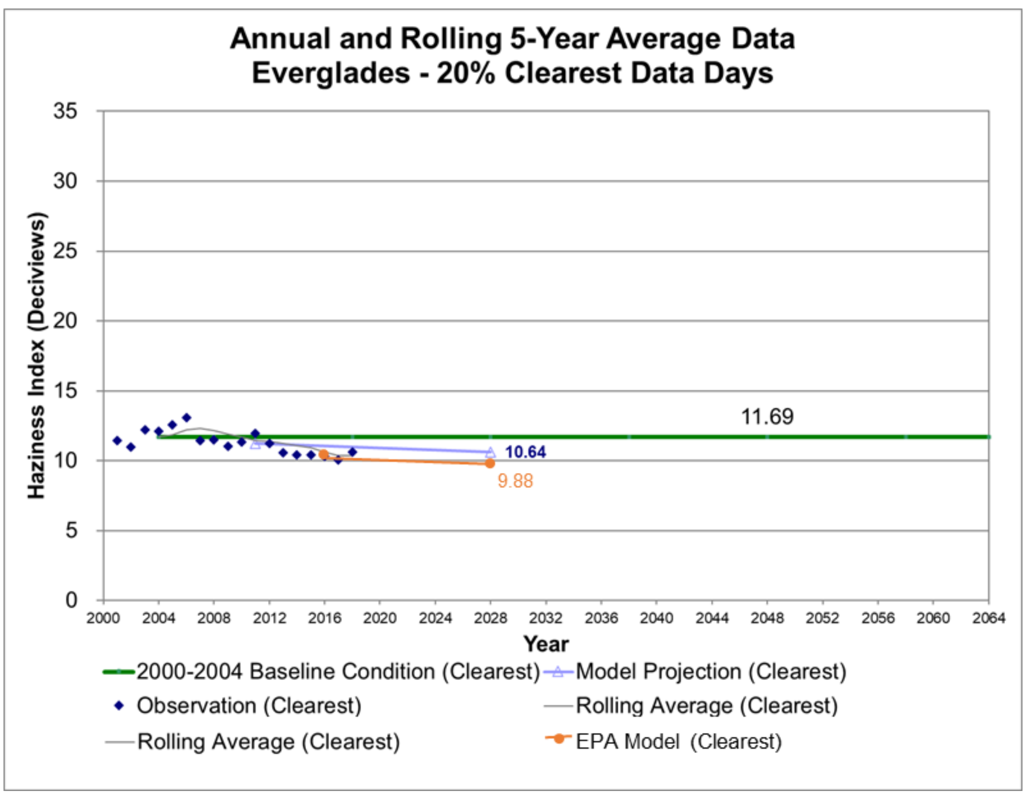
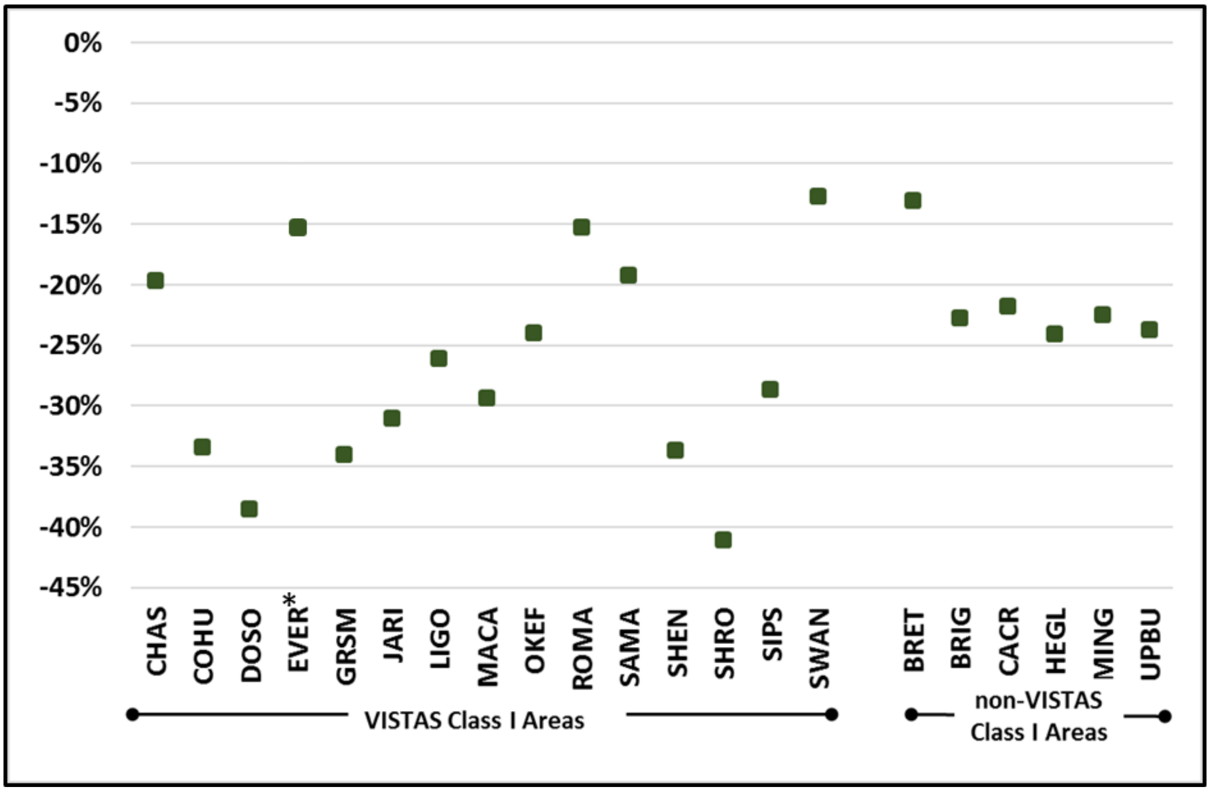


Figure 7-15: 20% Clearest Days Rate of Progress for Everglades

As illustrated in Figure 7-16, visibility on the 20% clearest days is projected to improve in 2028 at all VISTAS and non-VISTAS Class I areas as a result of the emission control programs included in the VISTAS 2028 emissions inventory. In this figure, a zero percent change indicates no change in visibility. A negative percentage indicates improvement in projected visibility while a positive change indicates visibility degradation. The percent improvement on 20% clearest days is projected to be 20% for Chassahowitzka, 19% for St. Marks, and 15% for Everglades.



*As discussed in Section 6.6, Florida relied on EPA's modeling for Everglades.

Figure 7-16: Percent Visibility Improvement on 20% Clearest Days

7.3. Relative Contribution from International Emissions to Visibility Impairment in 2028 at VISTAS Class I Areas

International anthropogenic emissions are beyond the control of states preparing regional haze SIPs. Therefore, the Regional Haze Rule at 40 CFR 51.308(f)(1)(vi)(B) allows states to optionally propose an adjustment of the 2064 uniform rate of progress endpoint to account for international anthropogenic impacts, if the adjustment has been developed using scientifically valid data and methods. On September 19, 2019, EPA released Technical Support Document for EPA's Updated 2028 Regional Haze Modeling.[50] This document provides the results of EPA's updated 2028 visibility modeling analyses and includes projections of both domestic and

[50] URL: https://www.epa.gov/visibility/technical-support-document-epas-updated-2028-regional-haze-modeling

international source contributions. EPA used source apportionment results to calculate the estimated source contribution of international anthropogenic emissions to visibility impairment at Class I areas on the 20% most impaired days. EPA used these estimated contributions to derive adjusted glide path endpoints for each federal Class I area.

In this study, EPA used the CAMx PSAT tool to tag certain sectors. EPA processed each sector through the SMOKE model and tracked each sector in PSAT as an individual source tag. EPA tracked sulfate, nitrate, ammonium, secondary organic aerosols, and primary PM in this manner. International anthropogenic emissions within this study include anthropogenic emissions from Canada and Mexico, C3 commercial marine emissions outside of the emissions control area as described in Section 7.2.1.4.4, and international anthropogenic boundary conditions.

Results from this study show that international anthropogenic boundary conditions account for a sizable fraction of sulfate concentrations in the west in certain months, and to a lesser extent nitrate. Estimated international anthropogenic visibility impairment ranges from 3.0 Mm^{-1} to 19.7 Mm^{-1}. For Class I areas located in VISTAS, total international anthropogenic emissions impacts range from 4.10 Mm^{-1} to 8.80 Mm^{-1}. Table 7-3 provides the estimated international anthropogenic visibility impacts to VISTAS Class I area from EPA's study.

Table 7-3: VISTAS Class I Area International Anthropogenic Emissions 2028 Impairment, Mm^{-1}

Class I Area Name	State	Site ID	Non-US C3 Marine	Canada	Mexico	Boundary International	Total International Anthropogenic
Cape Romain Wilderness Area	SC	ROMA	0.50	0.81	1.24	3.68	6.23
Chassahowitzka Wilderness Area	FL	CHAS	1.30	0.62	1.01	3.81	6.75
Cohutta Wilderness Area	GA	COHU	0.10	1.31	0.68	3.20	5.29
Dolly Sods Wilderness Area	WV	DOSO	0.05	2.11	0.53	2.31	4.99
Everglades National Park	FL	EVER	2.28	0.48	0.36	4.65	7.77
Great Smoky Mountains National Park	NC/TN	GRSM	0.09	1.38	0.54	2.83	4.48
James River Face Wilderness Area	VA	JARI	0.04	2.01	0.38	2.56	4.99
Joyce Kilmer-Slickrock Wilderness Area	NC/TN	JOYC	0.09	1.38	0.54	2.83	4.84
Linville Gorge Wilderness Area	NC	LIGO	0.04	1.42	0.39	2.26	4.10
Mammoth Cave National Park	KY	MACA	0.02	3.34	0.30	3.28	6.94
Okefenokee Wilderness Area	GA	OKEF	0.99	0.98	2.23	4.60	8.80
Otter Creek Wilderness Area	WV	OTCR	0.05	2.11	0.53	2.31	4.99
Shenandoah National Park	VA	SHEN	0.02	1.98	0.30	2.42	4.72
Shining Rock Wilderness Area	NC	SHRO	0.09	1.01	1.00	2.61	4.70
Sipsey Wilderness Area	AL	SIPS	0.09	1.45	0.74	2.83	5.12
St. Marks Wilderness Area	FL	SAMA	0.59	0.76	1.43	3.78	6.57
Swanquarter Wilderness Area	NC	SWAN	0.16	1.91	0.65	2.42	5.13
Wolf Island Wilderness Area	GA	WOLF	0.99	0.98	2.23	4.60	8.80

Florida Class I areas are expected to be below the 2028 uniform rate of progress in 2028 based on VISTAS modeling for Chassahowitzka and St. Marks and EPA modeling for Everglades, which includes current and forthcoming control programs. In this round of regional haze planning, Florida is not utilizing the international emissions impacts estimates to adjust the 2028 uniform rate of progress for Chassahowitzka, St. Marks, and Everglades.

7.4. Relative Contributions to Visibility Impairment: Pollutants, Source Categories, and Geographic Areas

To determine what areas and emissions source sectors impact VISTAS mandatory federal Class I areas, VISTAS relied on PSAT results examining the impacts of sulfate and nitrate from the following geographic areas and emissions sectors:

- Total SO_2 and NO_X emissions from each VISTAS state;
- Total SO_2 and NO_X emissions from the CENSARA, MANE-VU, and LADCO regional planning organizations;
- Total SO_2 and NO_X emissions from EGUs from each VISTAS state;
- Total SO_2 and NO_X emissions from EGUs from CENSARA, MANE-VU, and LADCO regional planning organizations;
- Total SO_2 and NO_X emissions from non-EGU point sources from each VISTAS state; and
- Total SO_2 and NO_X emissions from non-EGU point sources from CENSARA, MANE-VU, and LADCO regional planning organizations.

Visibility impacts in 2028 estimated by PSAT for each region (ten individual VISTAS states plus three RPOs), emission sector (total, EGU, and non-EGU), and pollutant (SO_2 and NO_X) at each mandatory federal Class I area are available for comparison.

Figure 7-17 shows the 2028 nitrate impairment from each region at federal mandatory Class I areas within VISTAS. Most federal mandatory Class I areas in VISTAS show contributions of less than 4 Mm^{-1} from nitrate in 2028, with the exceptions being Mammoth Cave, Sipsey, Cape Romain, and Swanquarter. All of the federal mandatory Class I areas in VISTAS show total contributions to nitrate impairment from the CENSARA, LADCO, and the MANE-VU sources (dark grey, medium grey, and light grey, respectively) that are larger than home state contributions, with the exception of Everglades and Okefenokee.

Figure 7-18 shows the 2028 sulfate impairment from each region at mandatory federal Class I areas within VISTAS. All areas, with the exception of Everglades, show sulfate impacts of at least 10 Mm^{-1}. All of the mandatory federal Class I areas in VISTAS show contributions to sulfate impairment from CENSARA, LADCO, and MANE-VU sources (dark grey, medium grey, and light grey, respectively) that are larger than home state contributions, with the exception of Everglades.

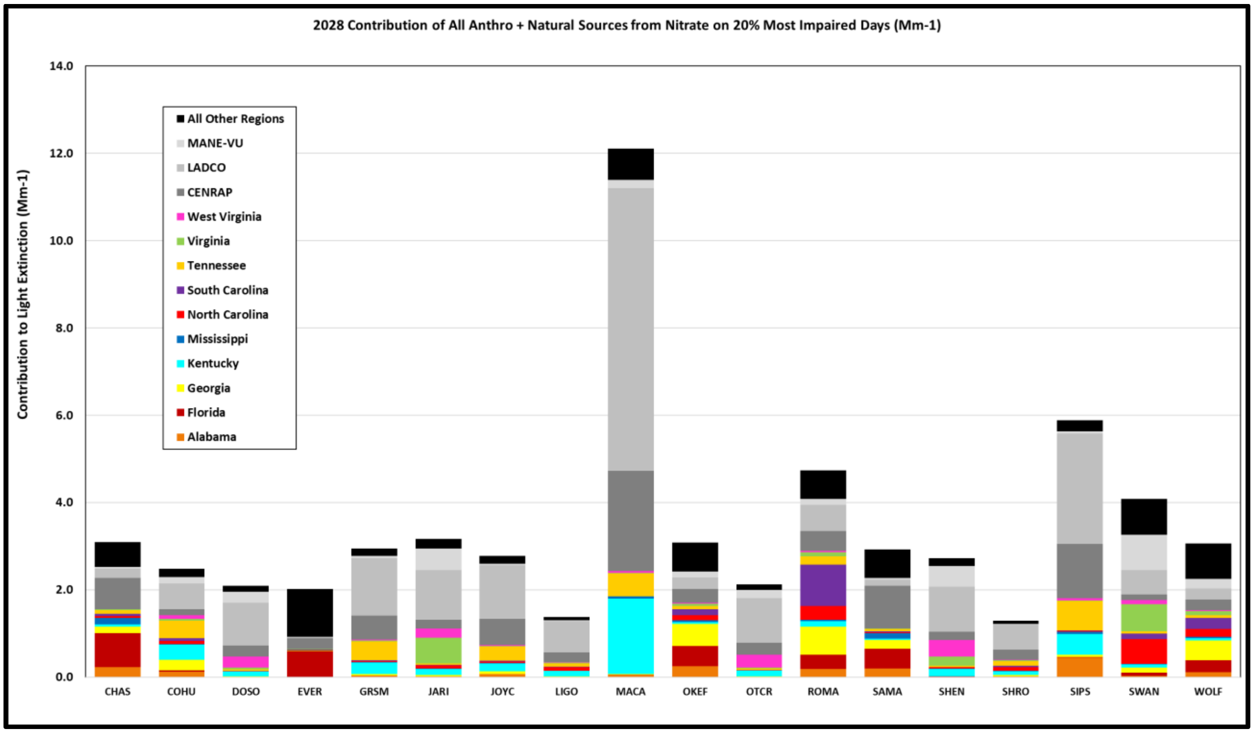


Figure 7-17: 2028 Nitrate Visibility Impairment, 20% Most Impaired Days, VISTAS Class I Areas

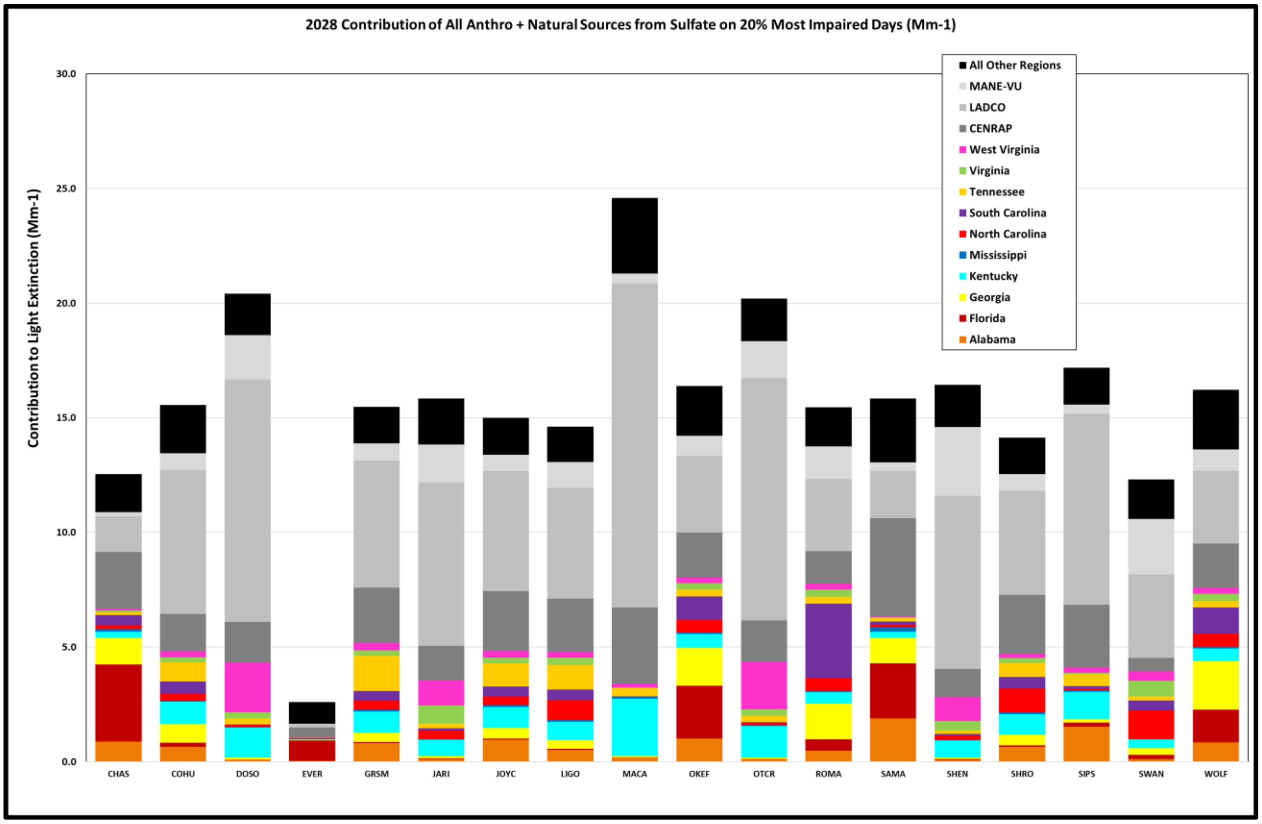


Figure 7-18: 2028 Sulfate Visibility Impairment, 20% Most Impaired Days, VISTAS Class I Areas

These figures indicate that sulfate continues to be the primary driver of visibility impairment in most federal mandatory VISTAS Class I areas. These figures also show that emissions from sources located outside of the home state and outside of VISTAS have a significant impact on visibility in federal mandatory VISTAS Class I areas.

Figure 7-20 and Figure 7-21 provide comparisons of projected light extinction from sulfate and nitrate in 2028 at federal mandatory Class I areas in VISTAS. These figures show the light extinction associated with all emissions within the pollutant inventory, the light extinction caused by emissions from the EGU sector, and light extinction caused by emissions from the non-EGU point source sector. Figure 7-20 shows these data for sulfate visibility impairment. Comparison of bar heights in this figure demonstrates that sulfate visibility impairment from the EGU and non-EGU point source sectors comprise the majority of the total sulfate visibility impairment at all federal mandatory Class I areas within VISTAS except Everglades. Figure 7-20 also shows that for some VISTAS federal mandatory Class I areas, visibility impairment due to sulfate from the EGU sector is significantly higher than visibility impairment due to sulfate from the non-EGU sector. Exceptions to this observation are Everglades, Okefenokee, Cape Romain, St. Marks, and Wolf Island. Projections for Okefenokee, Cape Romain, St. Marks, and Wolf Island show that EGU and non-EGU sulfate contributions are the majority of sulfate impairment but that the relative impacts from each sector are similar.

Unlike other Class I areas, the EGU and non-EGU sectors contribute a smaller portion of total sulfate impairment at Everglades. This is likely due to the unique mix of SO_2 sources around Everglades compared to other areas in Florida and VISTAS. Table 7-4 shows the sources of SO_2 around Everglades (including Broward, Collier, Miami-Dade and Monroe Counties) by Tier 1 Category in the 2017 National Emissions Inventory (NEI). As shown, the largest sources of SO_2 are from the Miscellaneous category (mainly wildfires and prescribed burning) and Off-Highway (mainly from Aircraft and Marine Vessels, which the Department does not have the authority to control). Together these source categories comprise almost two-thirds of the total 2017 SO_2 emissions around Everglades. Figure 7-19 shows the location of large point sources in Florida, all of which are located far from Everglades.

Table 7-4: Sources of SO_2 emissions by Tier 1 Category in the 2017 National Emissions Inventory around Everglades (Broward, Collier, Miami-Dade, and Monroe Counties)

Tier 1 Category (2017 NEI)	SO_2 Emissions (2017 NEI)	NO_X Emissions (2017 NEI)
Fuel Comb. Elec. Util.	195.73	4,785.90
Fuel Comb. Industrial	7.51	661.68
Fuel Comb. Other	61.31	1,072.24
Highway Vehicles	394.14	33,436.72
Metals Processing	14.98	3.20
Miscellaneous (Wildfires and Prescribed Burning)	2,063.53	3,515.74
Natural Resources (Biogenic)	0.00	1,978.63
Off-Highway (Aircraft and Marine Vessels)	1,139.85	13,215.41
Off-Highway (Other)	44.25	14,044.38
Other Industrial Processes	58.50	3,065.17
Petroleum & Related Industries	19.42	40.89
Storage & Transport	0.00	8.61
Waste Disposal & Recycling	959.64	340.86

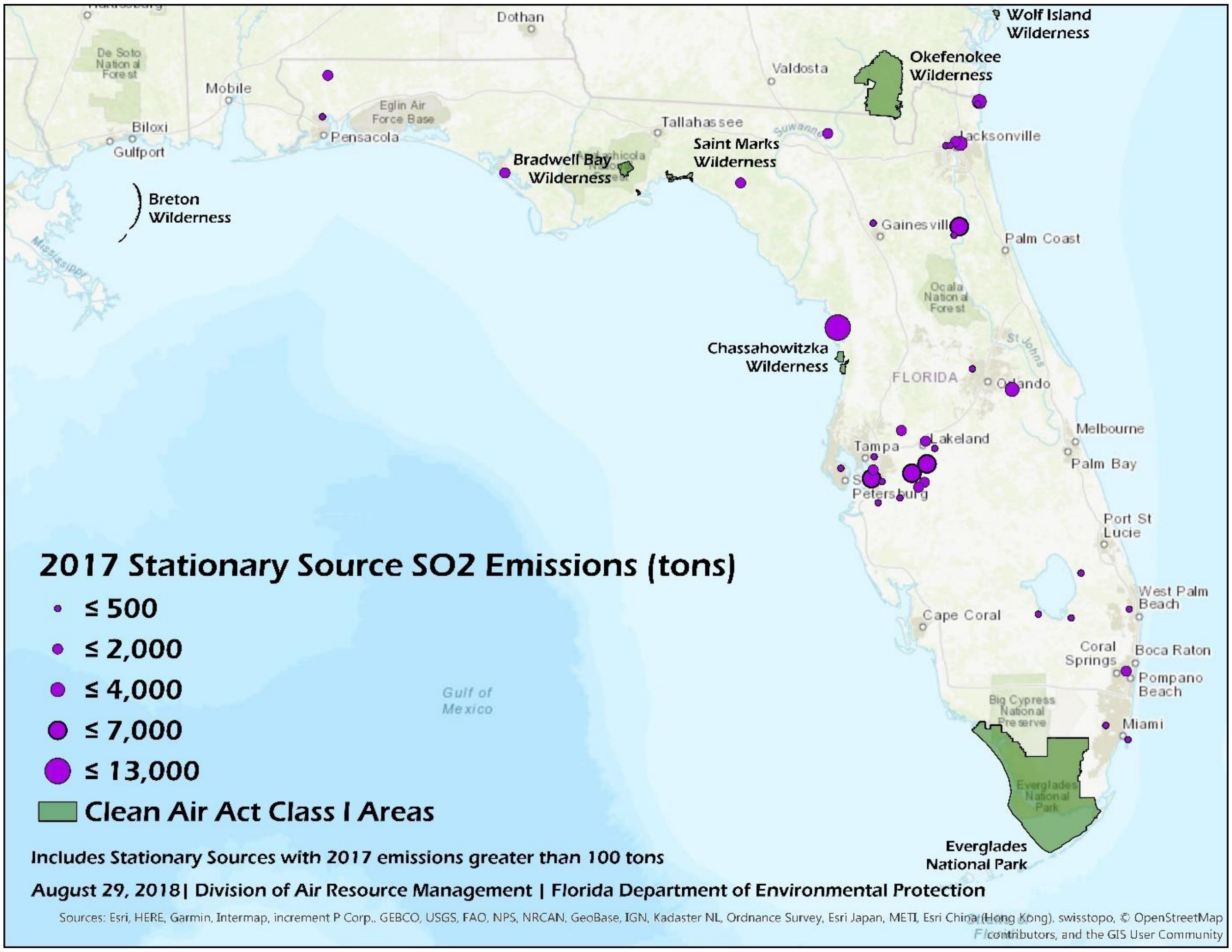


Figure 7-19: Location of Stationary Source SO_2 Emissions based on 2017 NEI Emissions

Figure 7-21 provides nitrate light extinction data in 2028 for federal mandatory Class I areas in VISTAS. In all but four cases, the total nitrate light extinction estimated for 2028 is well beneath 4 Mm^{-1}. In the case of Mammoth Cave, Cape Romain, Sipsey, and Swanquarter, total nitrate impairment is more than 4 Mm^{-1}, but the contributions from the EGU and non-EGU point source sectors are well under half of the total nitrate contribution.

Figure 7-20 and Figure 7-21 show that sulfates generally contribute more to light extinction in 2028 at VISTAS federal mandatory Class I areas than nitrates and that sulfates from EGU and non-EGU point source sectors contribute the majority of the sulfate light extinction at most of these areas. Results in Figure 7-21 also show that the majority of nitrate light extinction is not caused by NO_X emissions from EGU and non-EGU point sources.

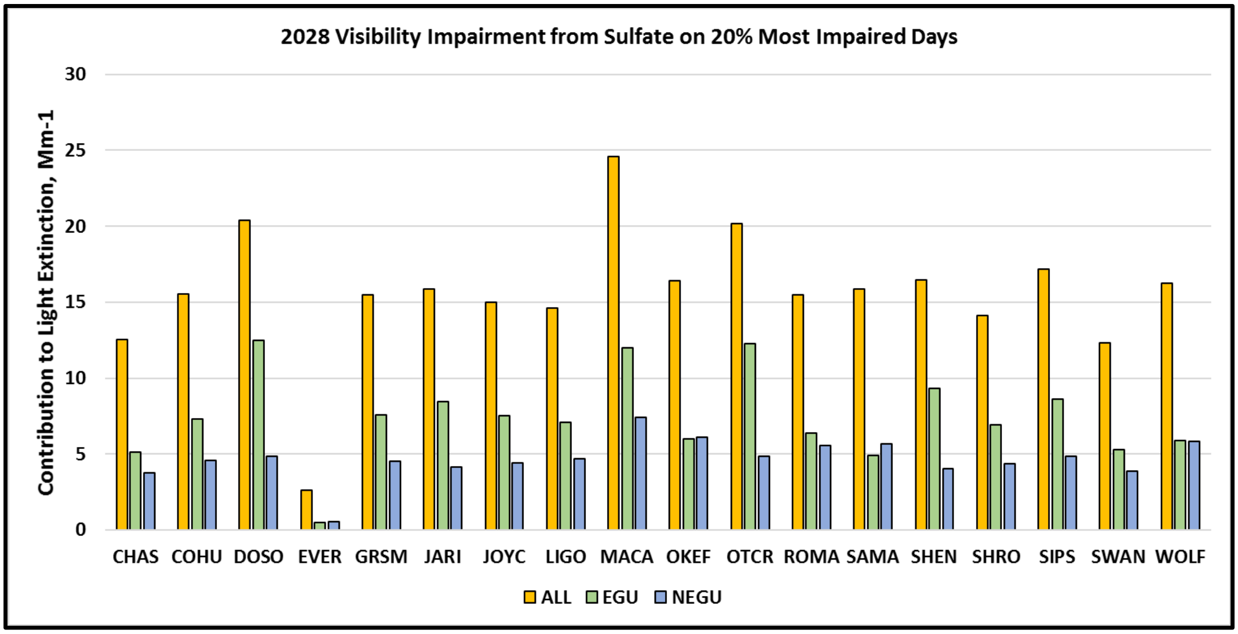


Figure 7-20: 2028 Visibility Impairment from Sulfate on 20% Most Impaired Days, VISTAS Class I Areas

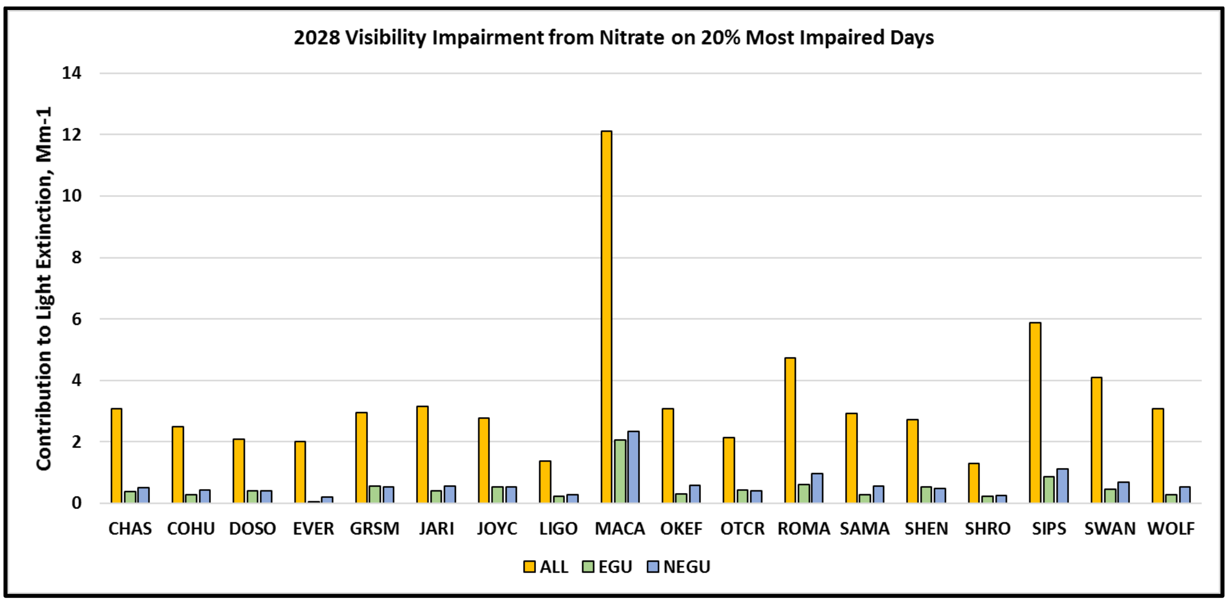


Figure 7-21: 2028 Visibility Impairment from Nitrate on 20% Most Impaired Days, VISTAS Class I Areas

These PSAT analyses support the following conclusions concerning the visibility impairing emissions, the source categories responsible for these emissions, and the locations of the pollutant emitting activities:

- Sulfate will generally be a much larger contributor to visibility impairment in 2028 at VISTAS mandatory federal Class I areas than nitrates.

- Emissions from other regional planning organizations (MANE-VU, LADCO, and CENSARA) generally have higher contributions to 2028 visibility impairment at federal mandatory Class I areas in VISTAS than the emissions from the home state.

- Emissions from EGUs and non-EGU point sources contribute the majority of the total sulfate contributions to visibility impairment in 2028 at mandatory Class I areas in VISTAS.

Figure 7-22, Figure 7-23, and Figure 7-24 provide more detailed comparisons for each Class I area. These figures show that projected light extinction in 2028 from total sulfate is significantly larger than light extinction from total nitrate. At each Class I area, projected total sulfate extinction is greater than 10 Mm^{-1} while total projected nitrate extinction is less than 5 Mm^{-1}. These figures also show that sulfate from EGUs and non-EGUs account for a significant portion of the total sulfate impact at these mandatory federal Class I areas in Florida. At Chassahowitzka, the 2028 sulfate extinction from EGUs and non-EGU point sources is 8.9 Mm^{-1} while the total sulfate extinction is 24.0 Mm^{-1}. Therefore, EGU and non-EGU point sources account for 37% of the total sulfate impact at Chassahowitzka. At St. Marks, the 2028 sulfate extinction from EGUs and non-EGU point sources is 10.6 Mm^{-1} while the total sulfate extinction is 25.1 Mm^{-1}. Therefore, EGU and non-EGU point sources account for 42% of the total sulfate impact at St. Marks. This supports the conclusion to focus on SO_2 emissions from EGUs and non-EGU point sources for these Class I areas.

At Everglades, Figure 7-24 shows that EGU and non-EGU point sources account for only 5% of the total sulfate impact at Everglades. Figure 7-25 also shows total 2028 projected light extinction from EPA's modeling (rightmost bars) and a breakdown of the US anthropogenic source contributions (pie chart). EPA's modeling also shows that EGU and non-EGU point sources contribute only approximately 5% to total light extinction at Everglades. As discussed above, the largest sources of SO_2 near Everglades are from wildfires, prescribed burning, airports, and offshore marine emissions. While emissions from wildfires and prescribed burning are addressed in Florida's Smoke Management Plan, the Department does not have the authority to control emissions from airports and offshore marine sources. However, the Department does have the authority to control emissions from EGU and non-EGU point sources. Therefore, the Department concluded that it would also focus on emissions from EGUs and non-EGU point sources of SO_2 for Everglades.

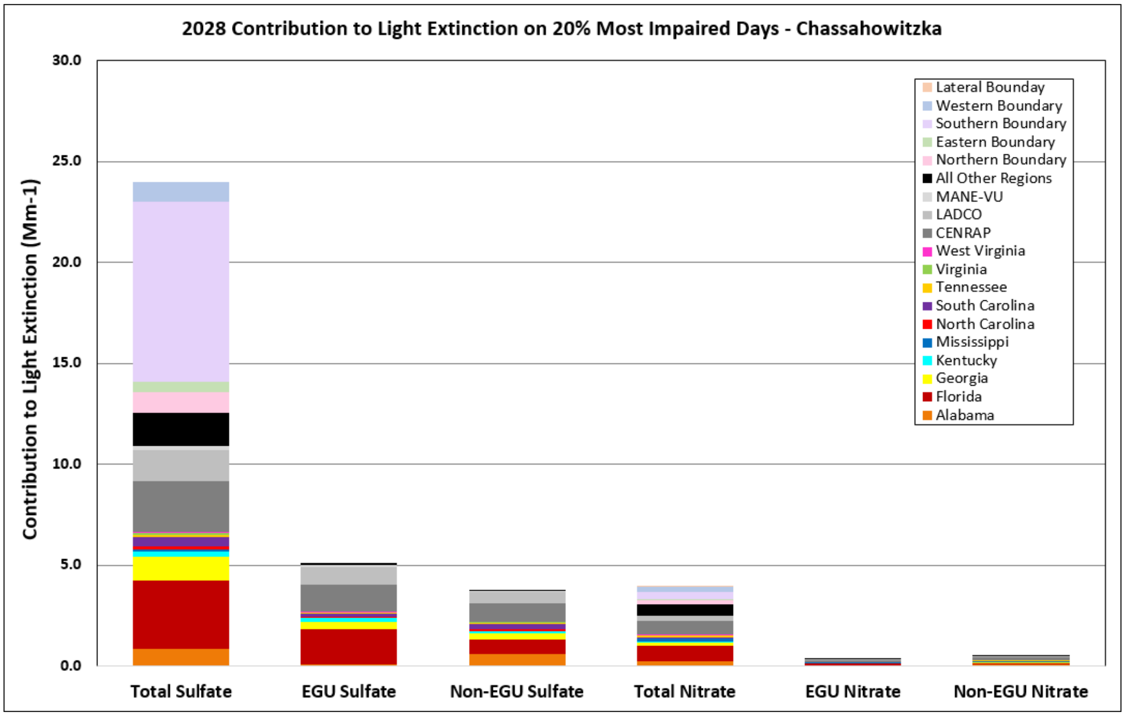


Figure 7-22: 2028 Contribution to Light Extinction on the 20% Most Impaired Days at Chassahowitzka

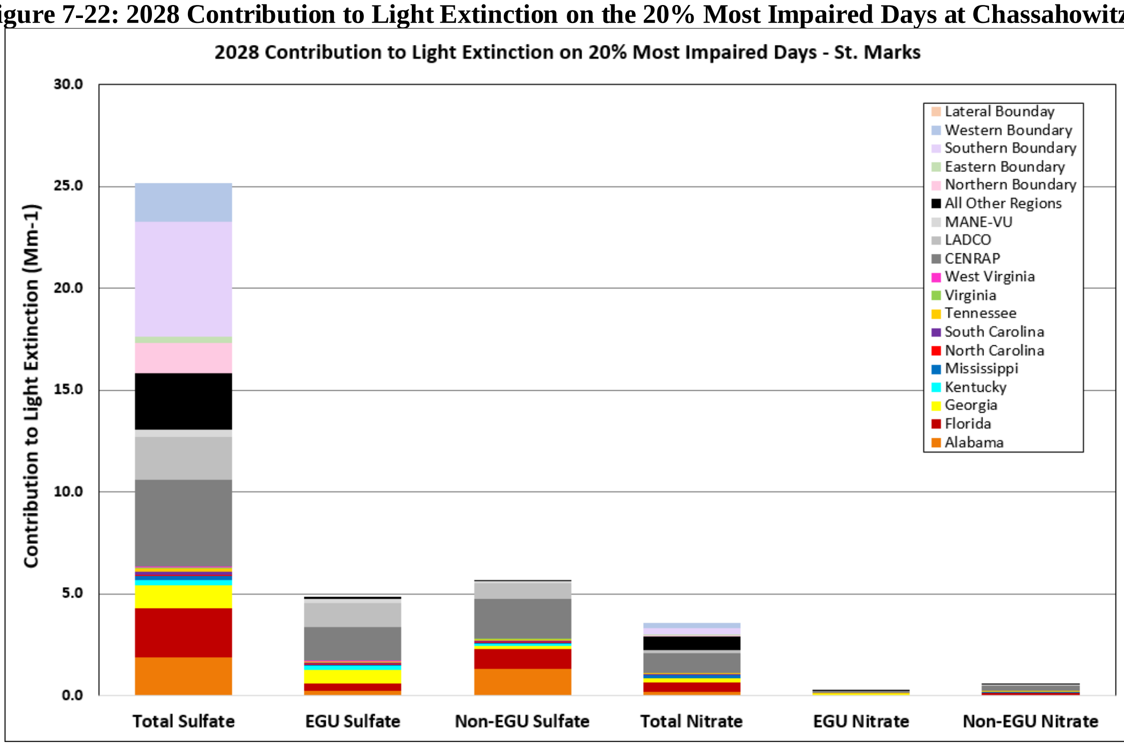


Figure 7-23: 2028 Contribution to Light Extinction on the 20% Most Impaired Days at St. Marks

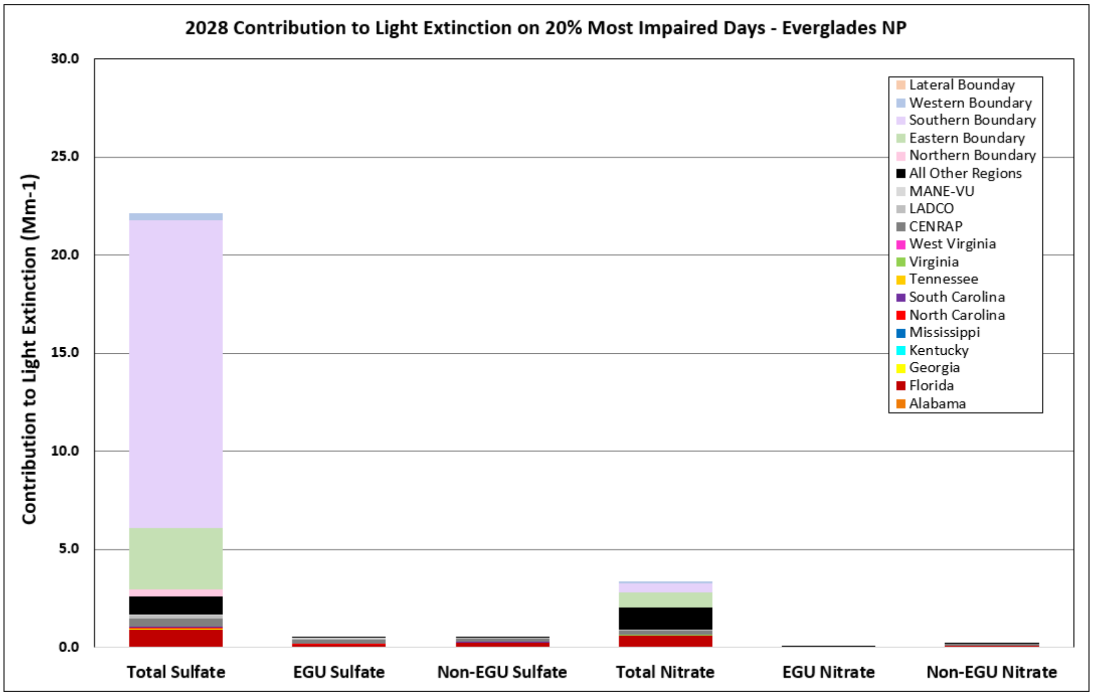


Figure 7-24: 2028 Contribution to Light Extinction on the 20% Most Impaired Days at Everglades

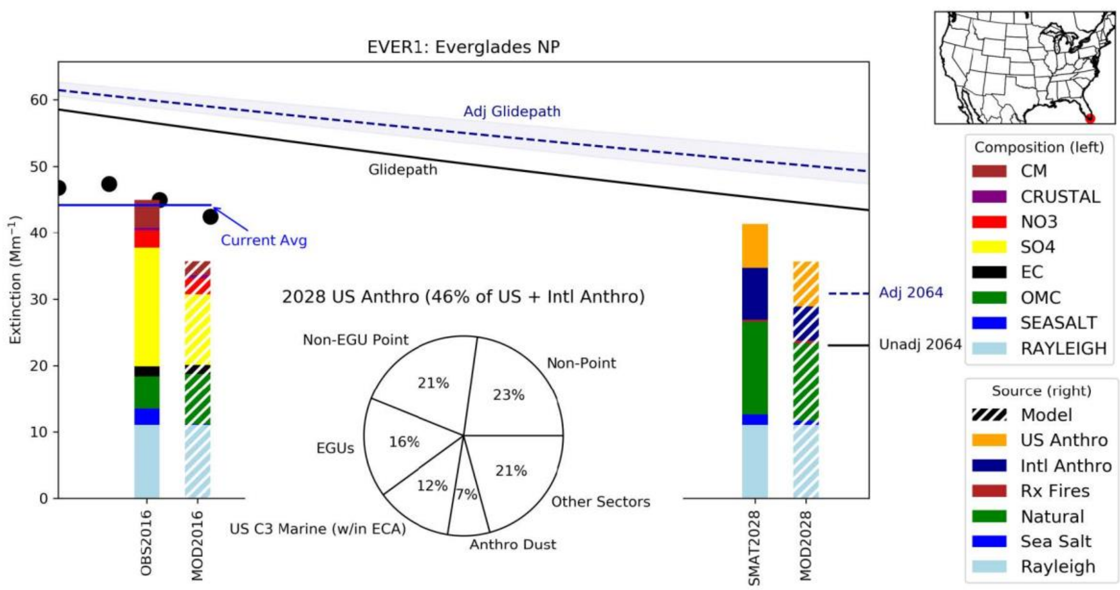


Figure 7-25: 2014-2017 IMPROVE observations, 2016 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Everglades from EPA's regional haze modeling.

EPA provided VISTAS an output file from the SMAT-CE tool showing visibility impairment at each Class I area by visibility impairing species. Figure 7-26 provides these outputs graphically for the VISTAS mandatory federal Class I area with an IMPROVE monitoring site. This figure, based on EPA's modeling, also shows that sulfates will continue to be the prevailing visibility impairing species in 2028 at VISTAS Class I areas. Figure 7-26 shows that sulfates, depicted by the yellow bars, have more than double the impact at each VISTAS Class I area as compared to nitrates, the next most prevalent species and depicted by the red bars, in all cases except Mammoth Cave. At Mammoth Cave, the projected 2028 sulfate to nitrate ratio is just under 2.0. These results corroborate the findings of the VISTAS study and indicate that focusing resources on the control of SO_2 is appropriate for this round of regional haze planning. Appendix E-8 provides the data supplied by EPA from their 2019 modeling study.

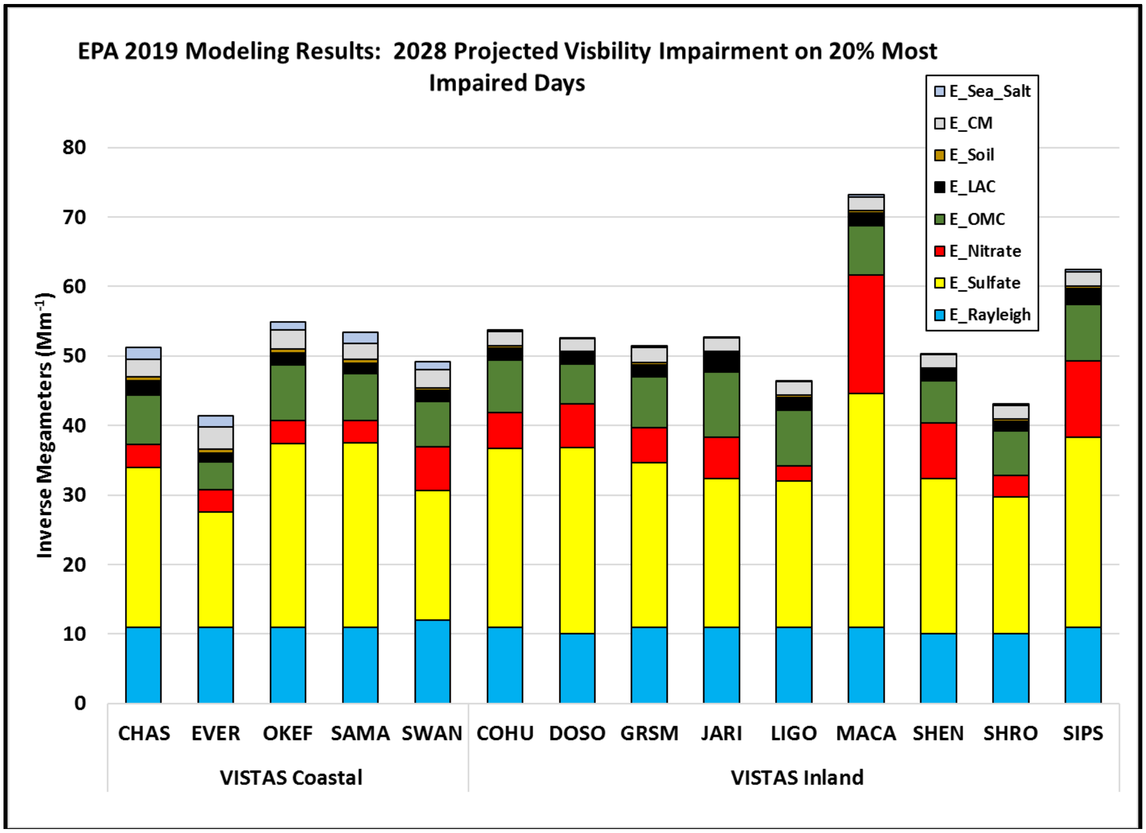


Figure 7-26: 2028 Projected Visibility Impairment by Pollutant Species, EPA 2019 Modeling Results

7.5. Area of Influence Analyses for Florida Class I Areas

Once the key pollutants and source categories contributing to visibility impairment at each Class I area have been identified, it is necessary to focus on the greatest contributing sources. Facility-level SO_2 and NO_X area of influence (AoI) analyses were performed for each Class I area to determine the relative visibility impact from each facility. Then, these facilities were ranked by their sulfate and nitrate visibility contribution at each Class I area. In addition, county-level AoI analyses were performed to confirm that SO_2 emissions from EGU and non-EGU point sources are the greatest contributors to visibility impairment at VISTAS Class I areas. The following sections contain a broad overview of the steps in the AoI analyses. See Appendix D for a more detailed discussion of these analyses and plots for additional Class I areas.

7.5.1. Back Trajectory Analyses

The first step was to generate Hybrid Single Particle Lagrangian Integration Trajectory (HYSPLIT)[51] back trajectories for IMPROVE monitoring sites in Florida and neighboring Class I areas for 2011-2016 on the 20% most impaired days. Back trajectory analyses use interpolated measured or modeled meteorological fields to estimate the most likely central path of air masses that arrive at a receptor at a given time. The method essentially follows a parcel of air backward in hourly steps for a specified length of time.

The HYSPLIT runs included starting heights of 100 meters (m), 500 m, 1,000 m, and 1,500 m. Trajectories were run 72 hours backwards in time for each height at each location. Trajectories were run with start times of 12:00 a.m. (midnight of the start of the day), 6:00 a.m., 12:00 p.m., 6:00 p.m., and 12:00 a.m. (midnight at the end of the day) local time.

Figure 7-27, Figure 7-28, and Figure 7-29 contain the 100-meter back trajectories for the 20% most impaired visibility days (2011-2016) at Chassahowitzka, St. Marks, and Everglades, respectively. Figure 7-30, Figure 7-31, and Figure 7-32 contain the 100-meter back trajectories by season for the 20% most impaired visibility days (2011-2016) at Chassahowitzka, St. Marks, and Everglades, respectively. Figure 7-33, Figure 7-34, and Figure 7-35 contain the 100-meter, 500-meter, 1000-meter, and 1500-meter back trajectories for the 20% most impaired visibility days (2011-2016) at Chassahowitzka, St. Marks, and Everglades, respectively. These back trajectories for the 20% most impaired days were then used to develop residence time (RT) plots.

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[51] Stein, A. F., Draxler, R. R., Rolph, G. D., Stunder, B. J. B., Cohen, M. D., and Ngan, F., (2015). NOAA's HYSPLIT atmospheric transport and dispersion modeling system, Bull. Amer. Meteor. Soc., 96, 2059-2077, http://dx.doi.org/10.1175/BAMS-D-14-00110.1

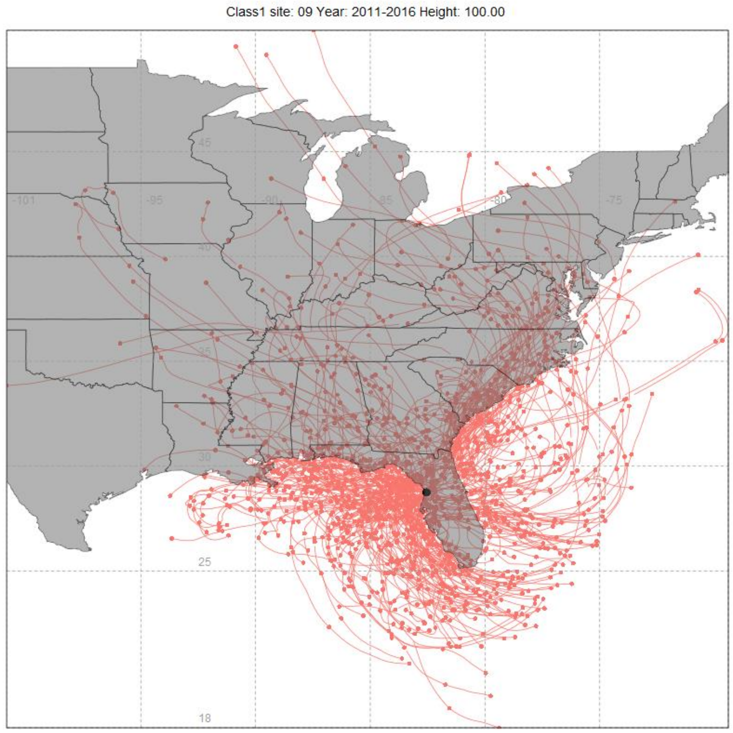


Figure 7-27: 100-Meter Back Trajectories for the 20% Most Impaired Visibility Days (2011-2016), from Chassahowitzka

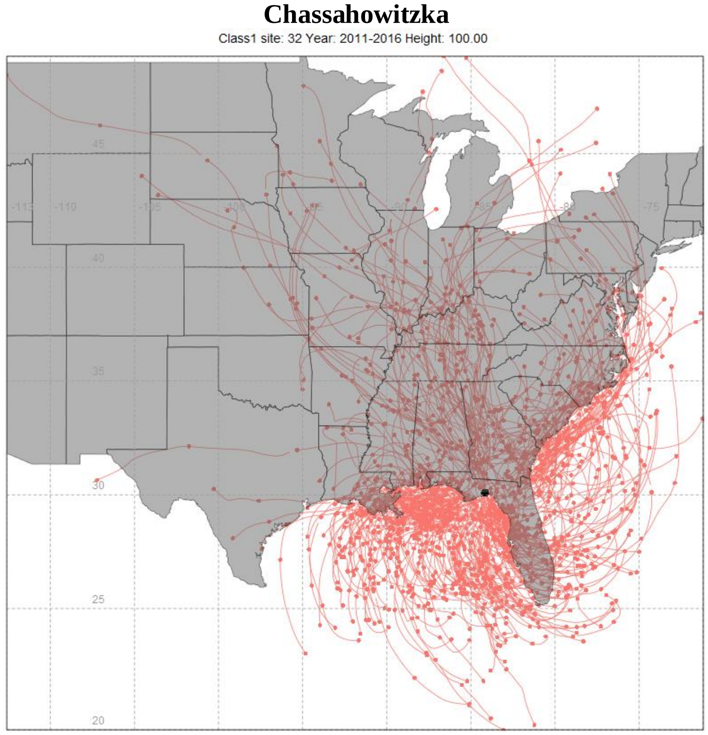


Figure 7-28: 100-Meter Back Trajectories for the 20% Most Impaired Visibility Days (2011-2016), from St. Marks

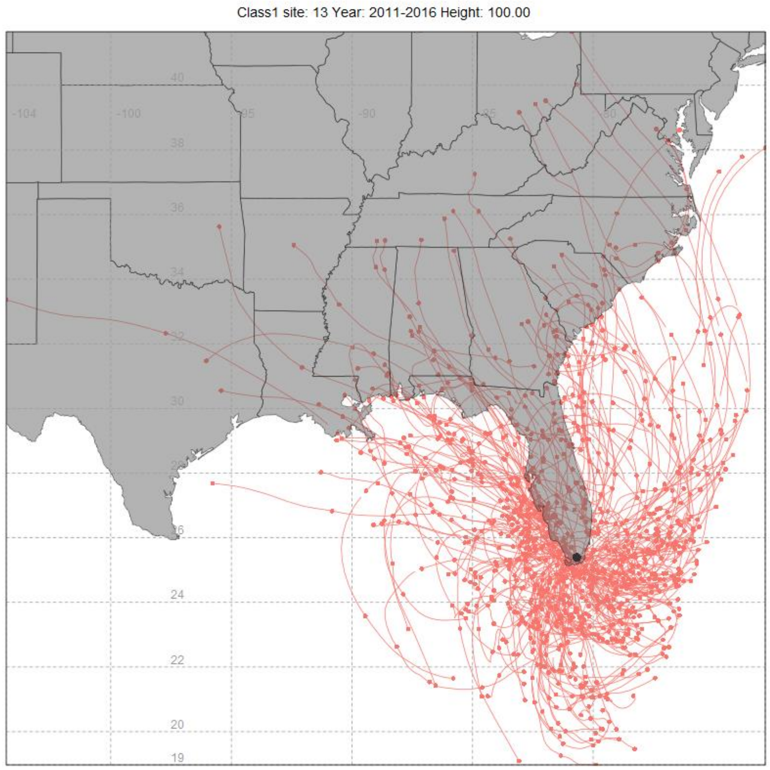


Figure 7-29: 100-Meter Back Trajectories for the 20% Most Impaired Visibility Days (2011-2016), from Everglades

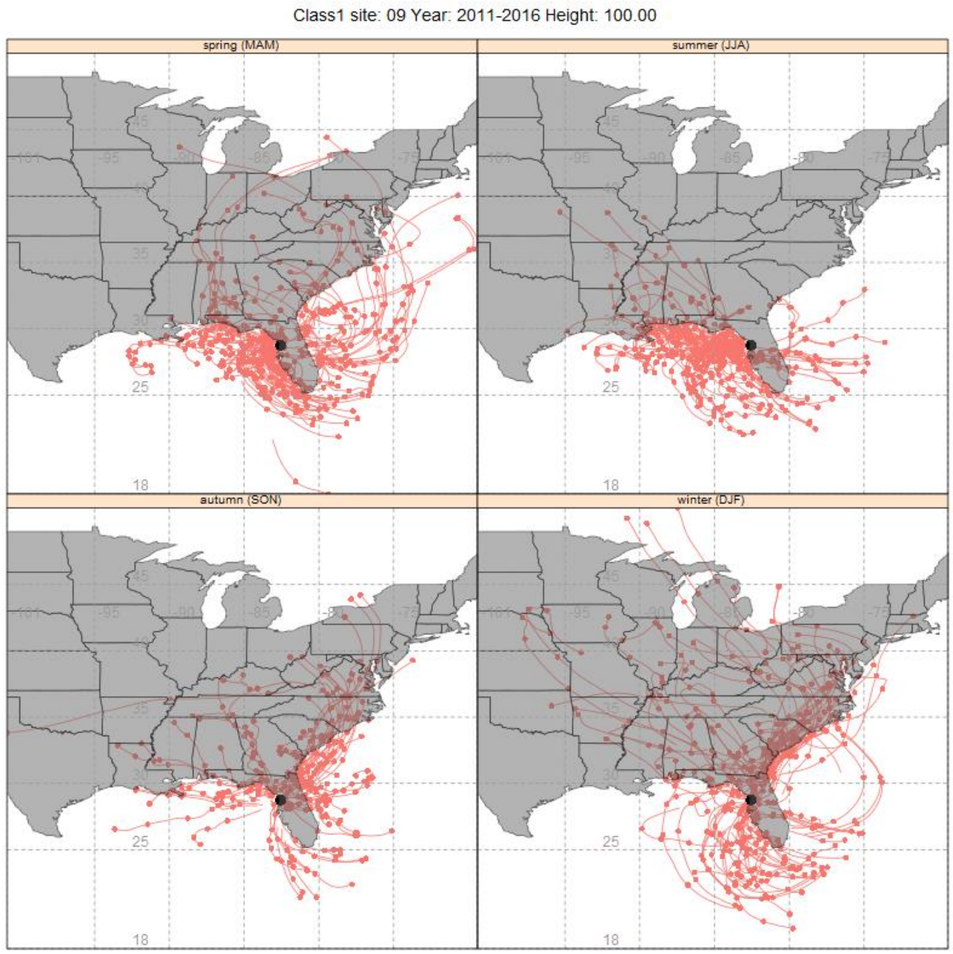


Figure 7-30: 100-Meter Back Trajectories by Season for the 20% Most Impaired Visibility Days (2011-2016) from Chassahowitzka

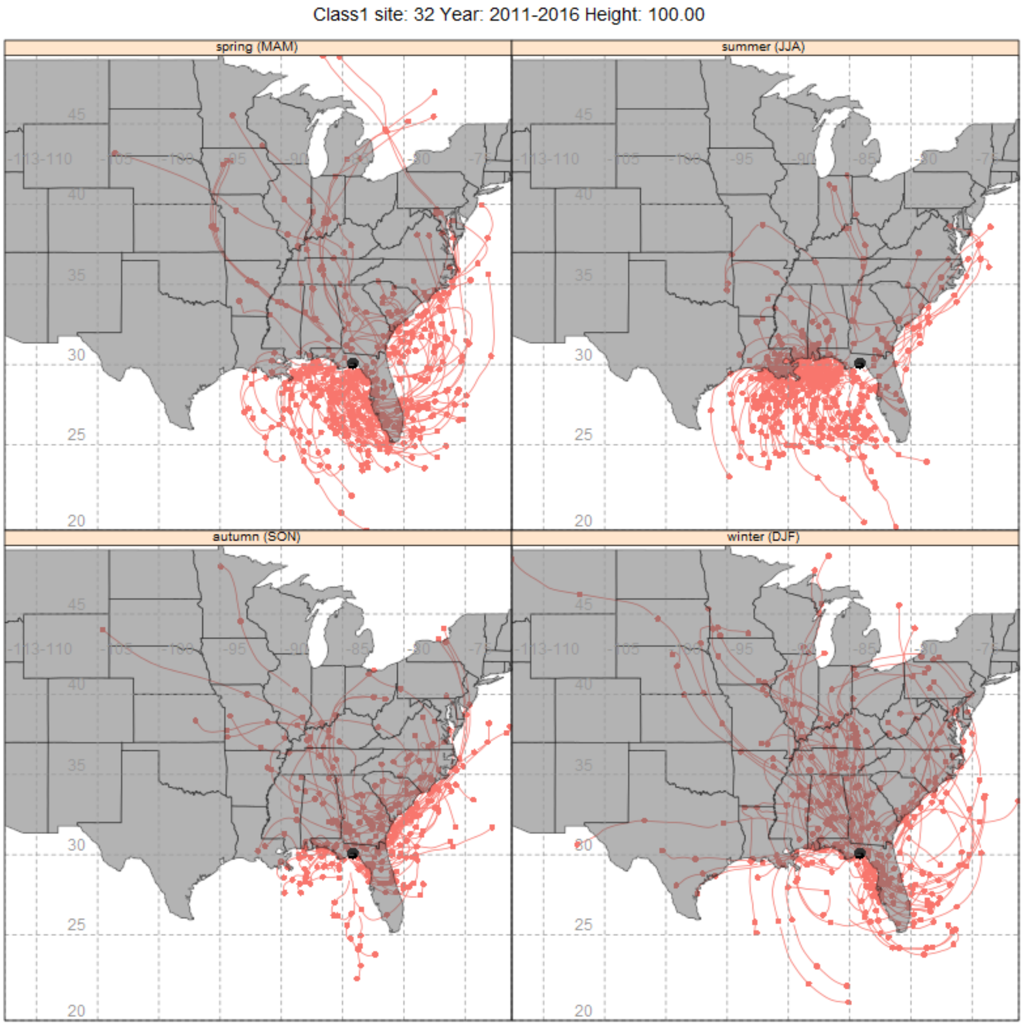


Figure 7-31: 100-Meter Back Trajectories by Season for the 20% Most Impaired Visibility Days (2011-2016) from St. Marks

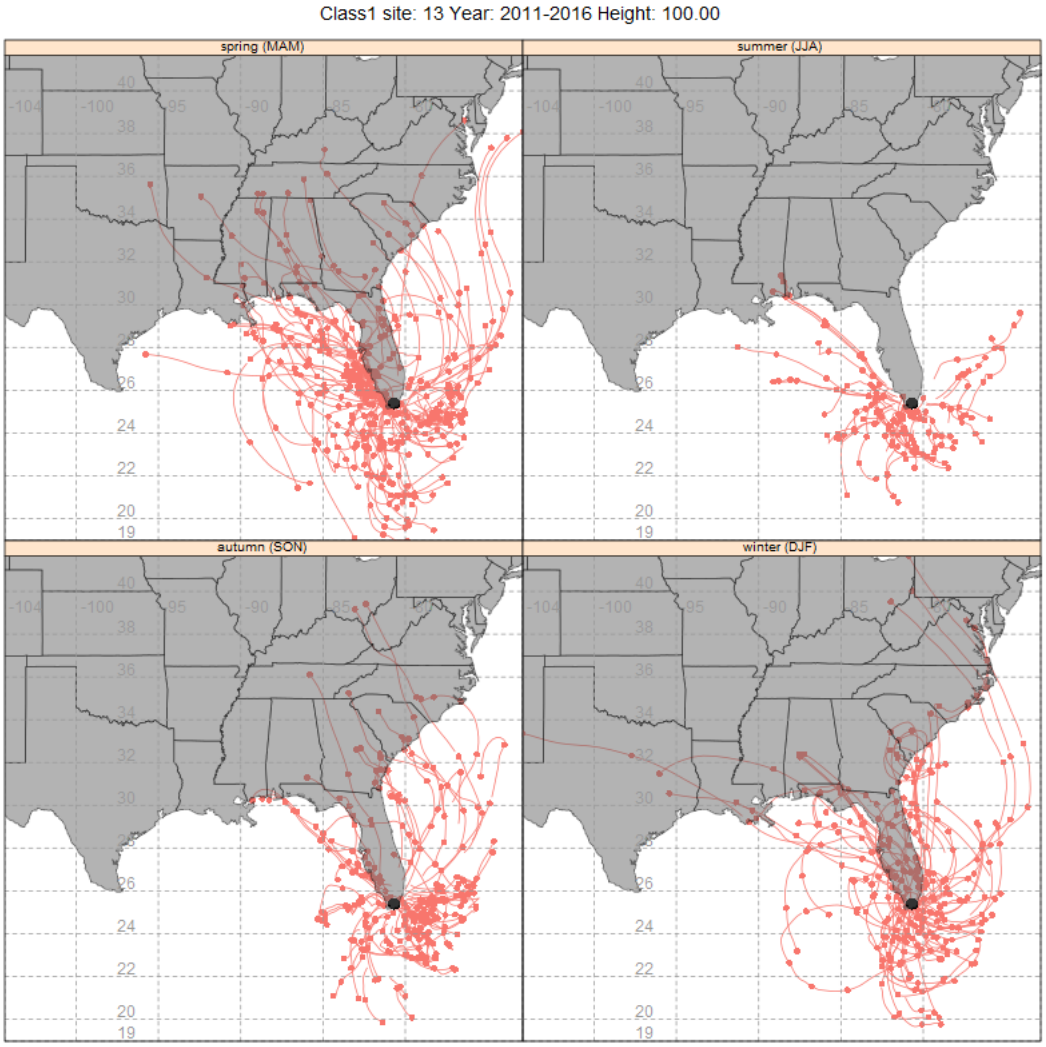


Figure 7-32: 100-Meter Back Trajectories by Season for the 20% Most Impaired Visibility Days (2011-2016) from Everglades

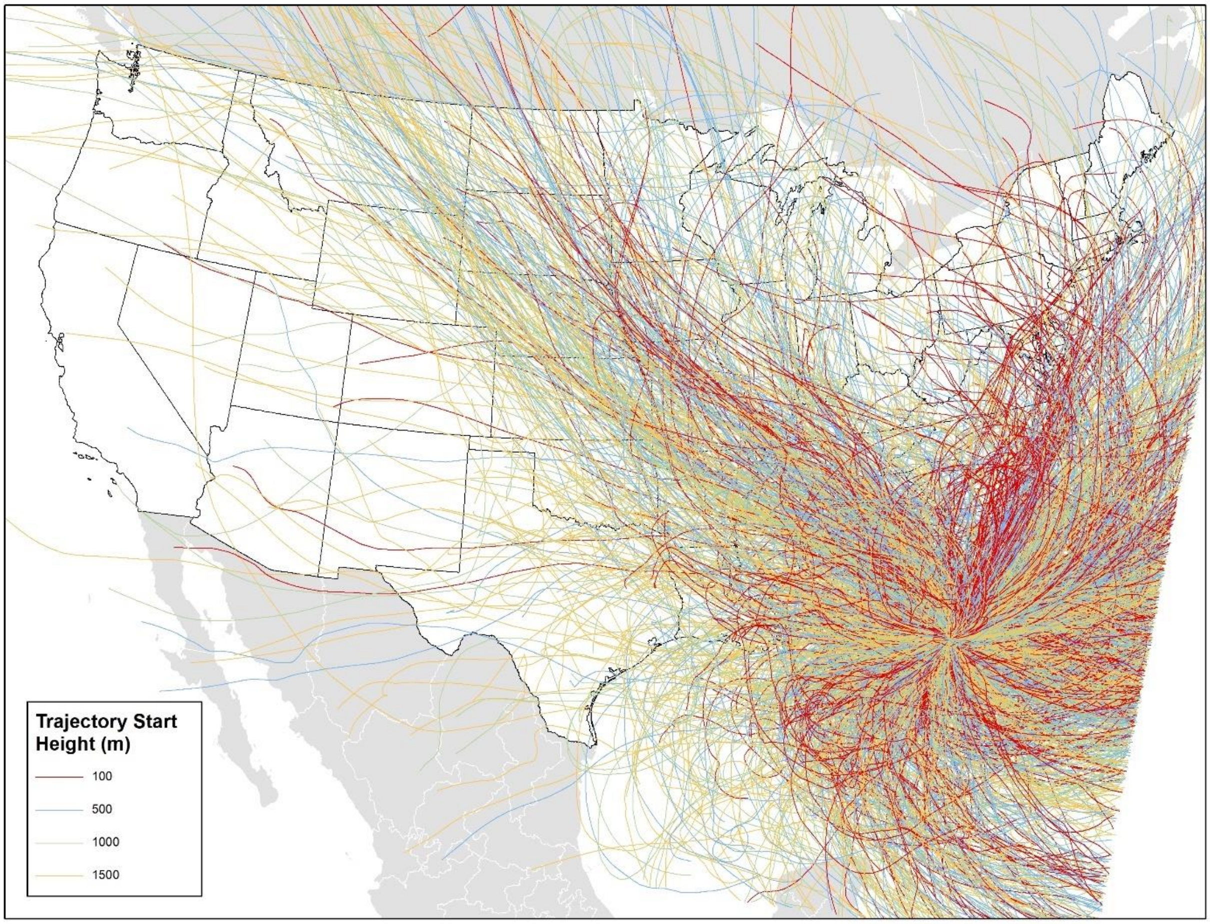


Figure 7-33: 100-Meter, 500-Meter, 1000-Meter, and 1500-Meter Back Trajectories for the 20% Most Impaired Days (2011-2016) from Chassahowitzka

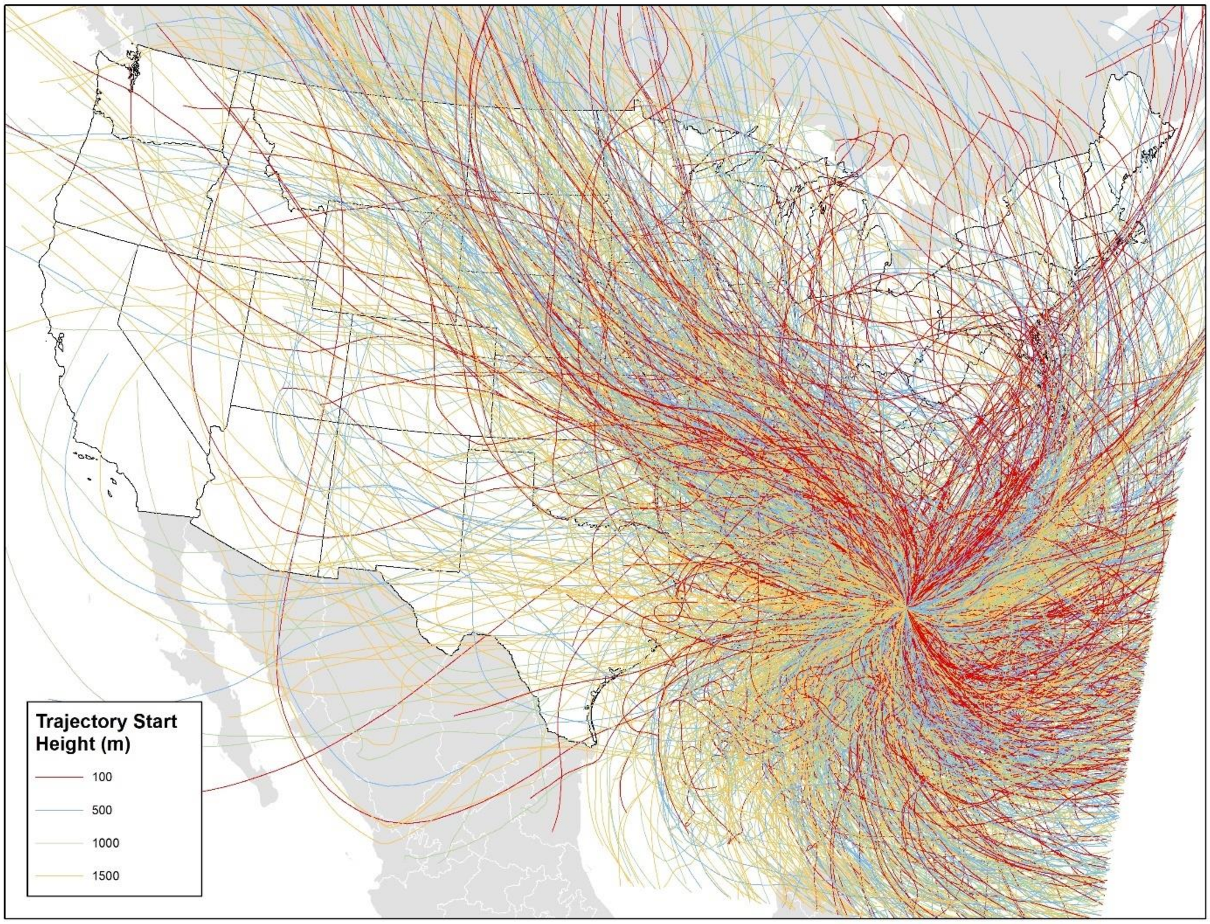


Figure 7-34: 100-Meter, 500-Meter, 1000-Meter, and 1500-Meter Back Trajectories for the 20% Most Impaired Days (2011-2016) from St. Marks

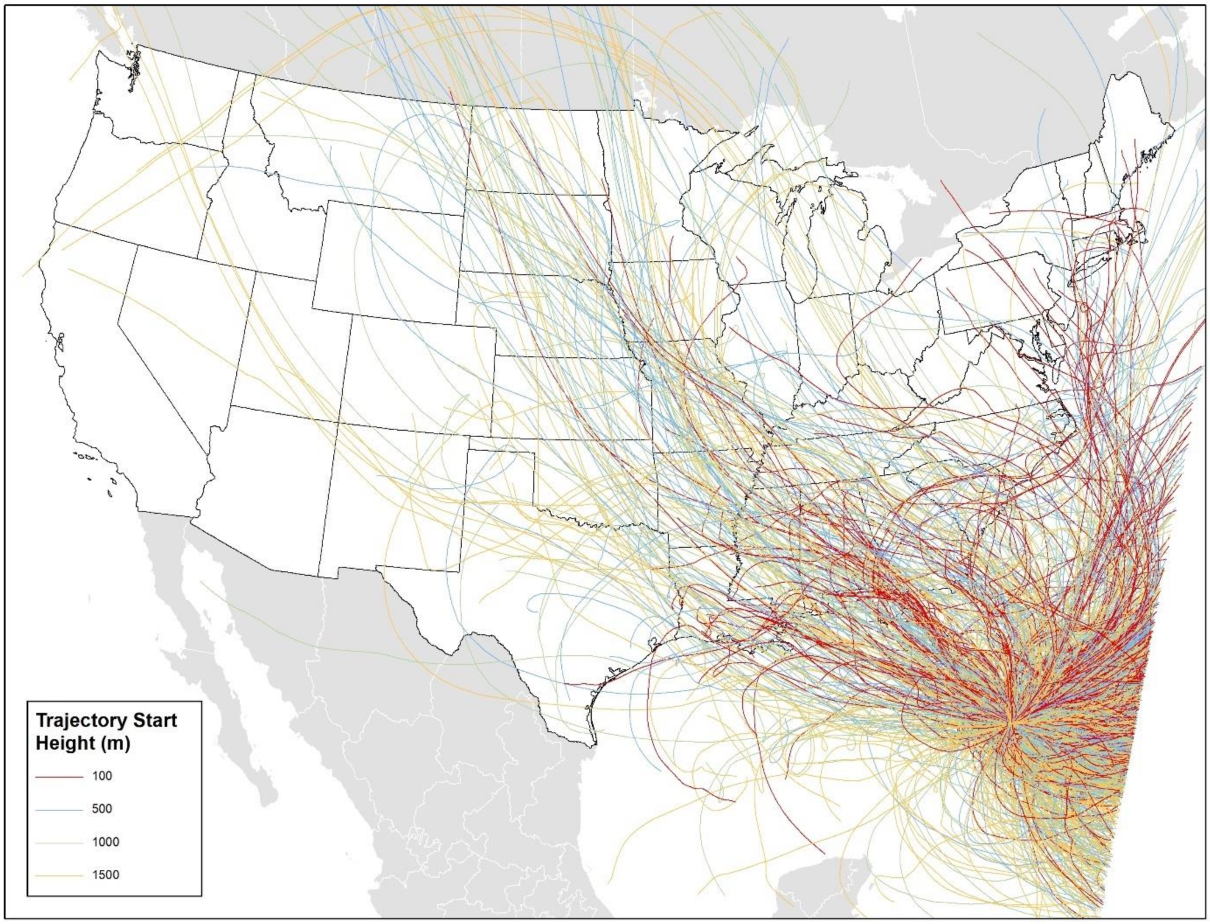
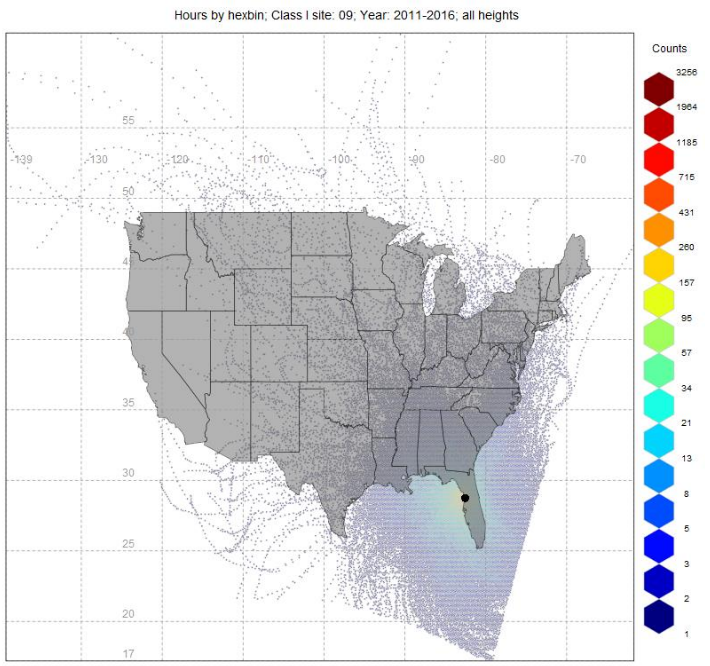


Figure 7-35: 100-Meter, 500-Meter, 1000-Meter, and 1500-Meter Back Trajectories for the 20% Most Impaired Days (2011-2016) from Everglades

7.5.2. Residence Time Plots

The next step was to plot RT for each Class I area using six years of back trajectories for the 20 % most impaired visibility days in 2011-2016. Residence time is the frequency that winds pass over a specific geographic area (model grid cell or county) on the path to a Class I area. Residence time plots include all trajectories for each Class I area.

Figure 7-36, Figure 7-37, and Figure 7-38 contain the RT (counts per 12-km modeling grid cell) for Chassahowitzka, St. Marks, and Everglades, respectively. Figure 7-39, Figure 7-40, and Figure 7-41 contain the residence time (percent of total counts per 12-km modeling grid cell) for Chassahowitzka, St. Marks, and Everglades, respectively. As illustrated in these figures, winds influencing these Class I areas on the 20% most impaired days come from all directions. and there is no single predominant wind direction influencing the 20% most impaired visibility days.



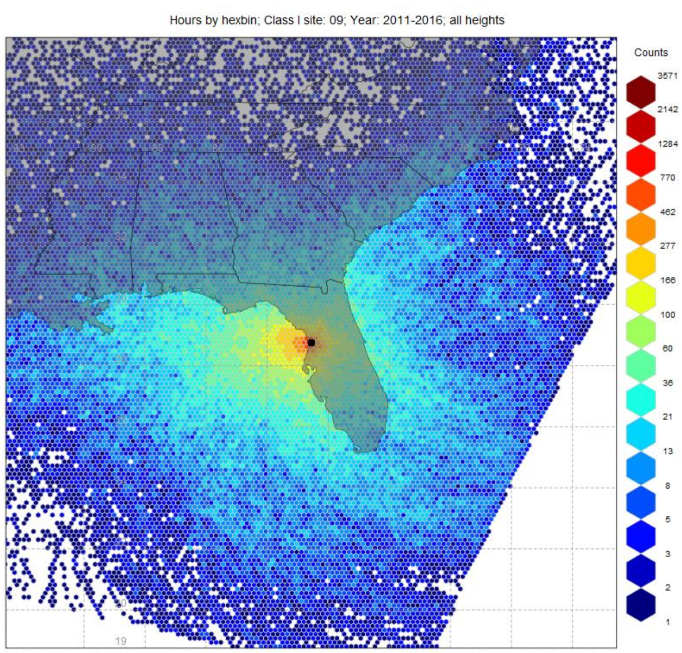


Figure 7-36: Residence Time (Counts per 12km Modeling Grid Cell) for Chassahowitzka – Full View (top) and Class I Zoom (bottom)

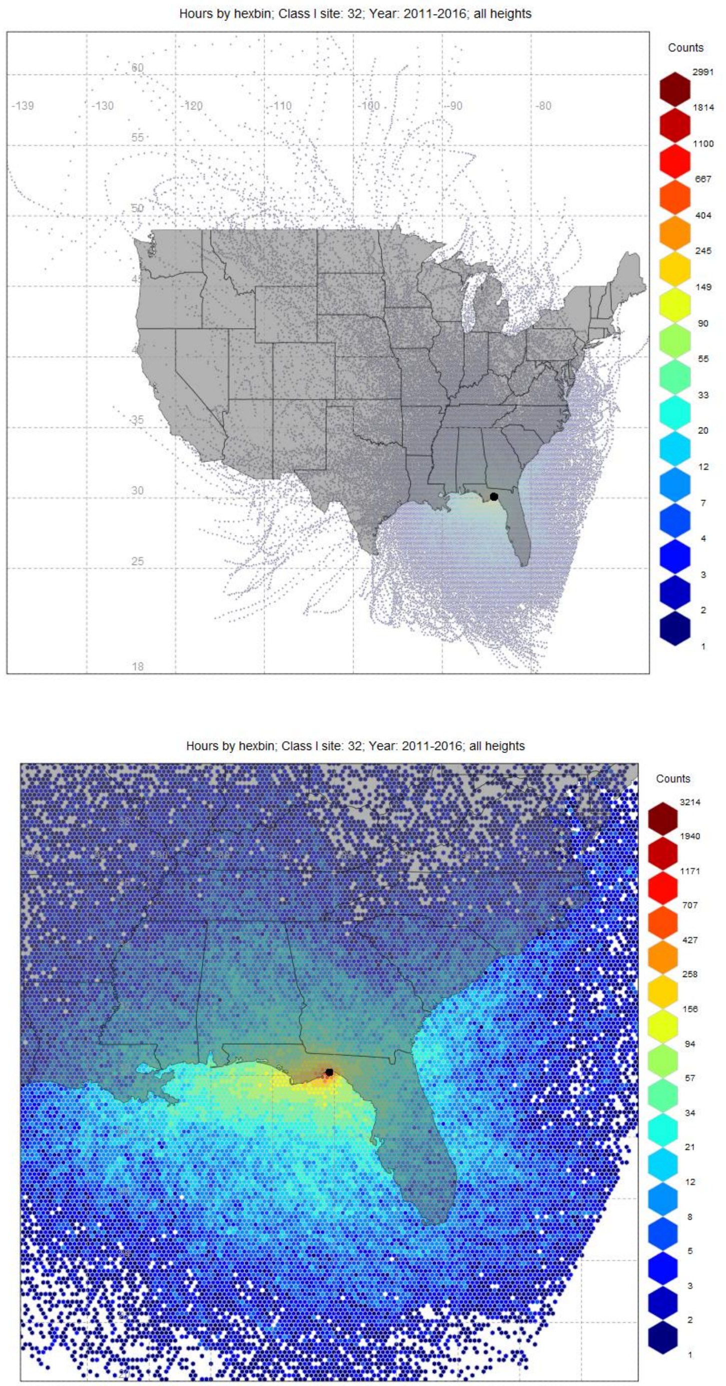


Figure 7-37: Residence Time (Counts per 12km Modeling Grid Cell) for St. Marks – Full View (top) and Class I Zoom (bottom)

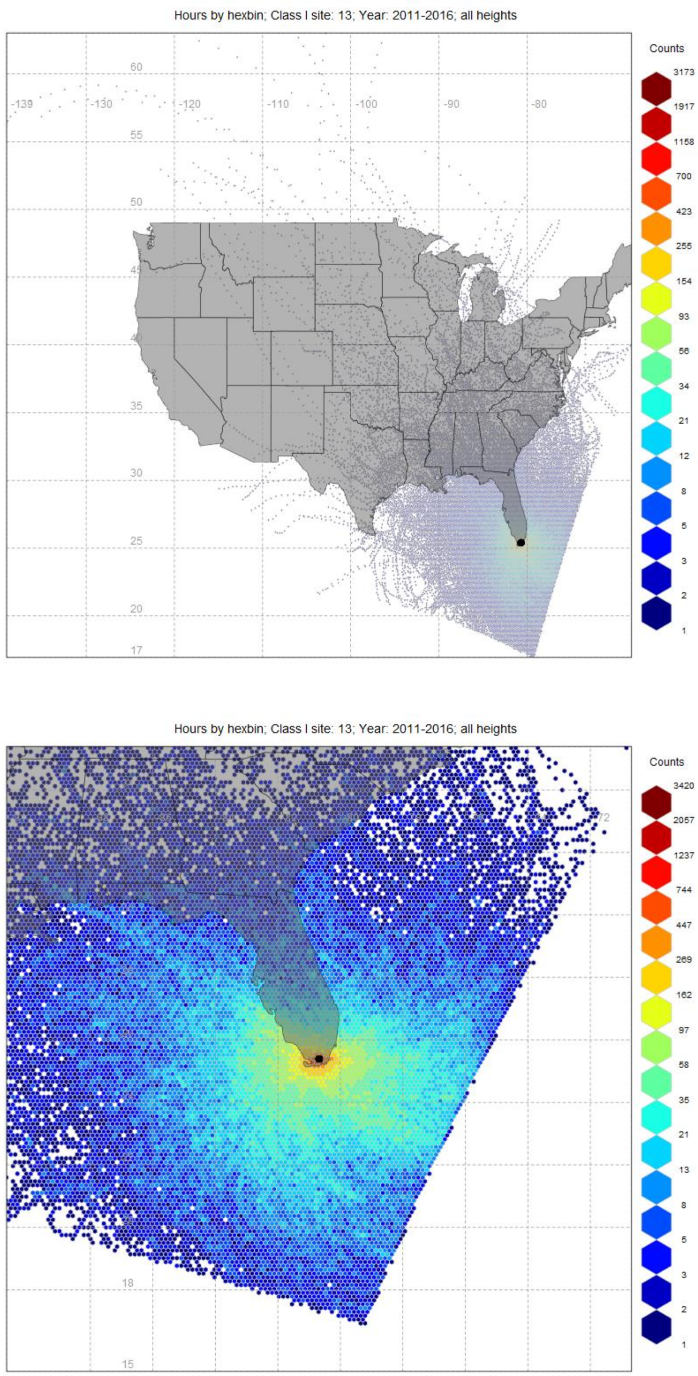


Figure 7-38: Residence Time (Counts per 12km Modeling Grid Cell) for Everglades – Full View (top) and Class I Zoom (bottom)

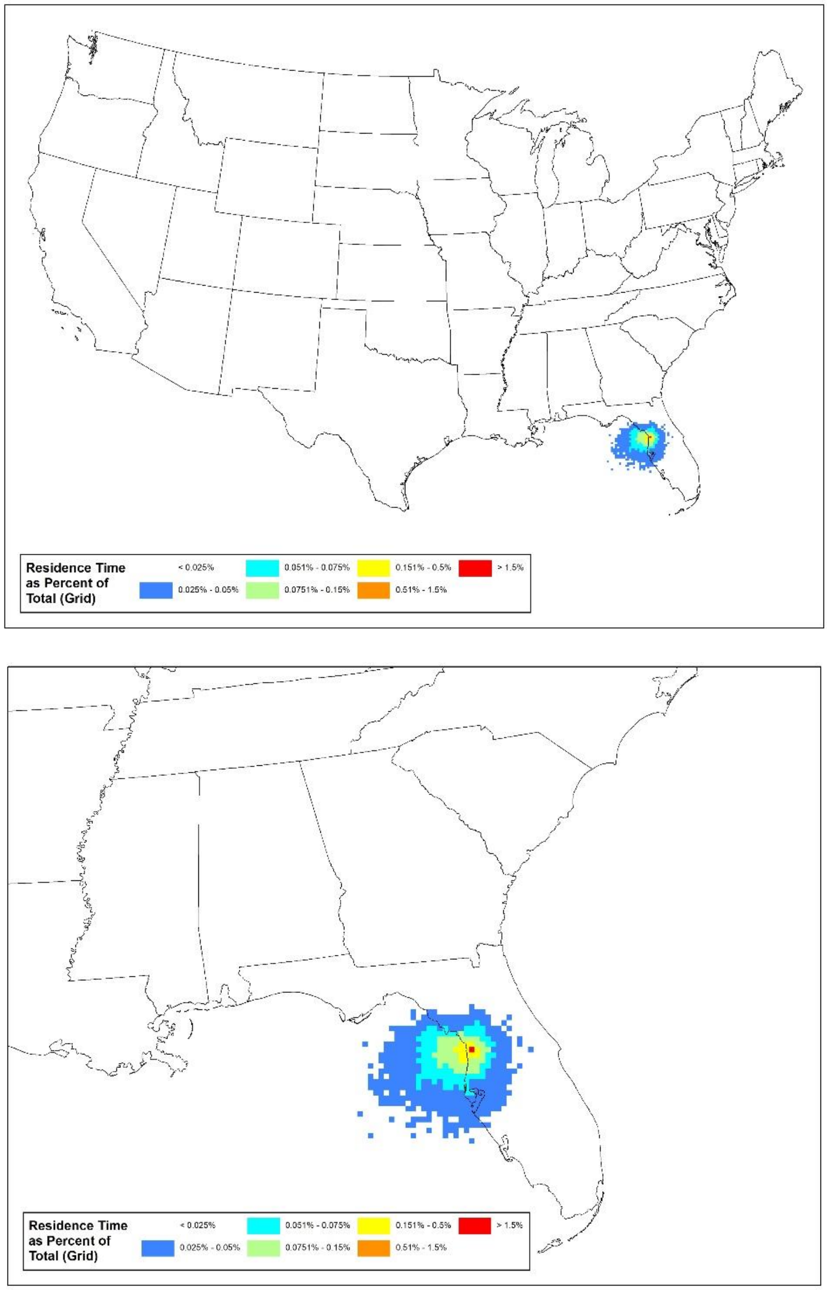


Figure 7-39: Residence Time (% of Total Counts per 12km Modeling Grid Cell for Chassahowitzka – Full View (top) and Class I Zoom (bottom)

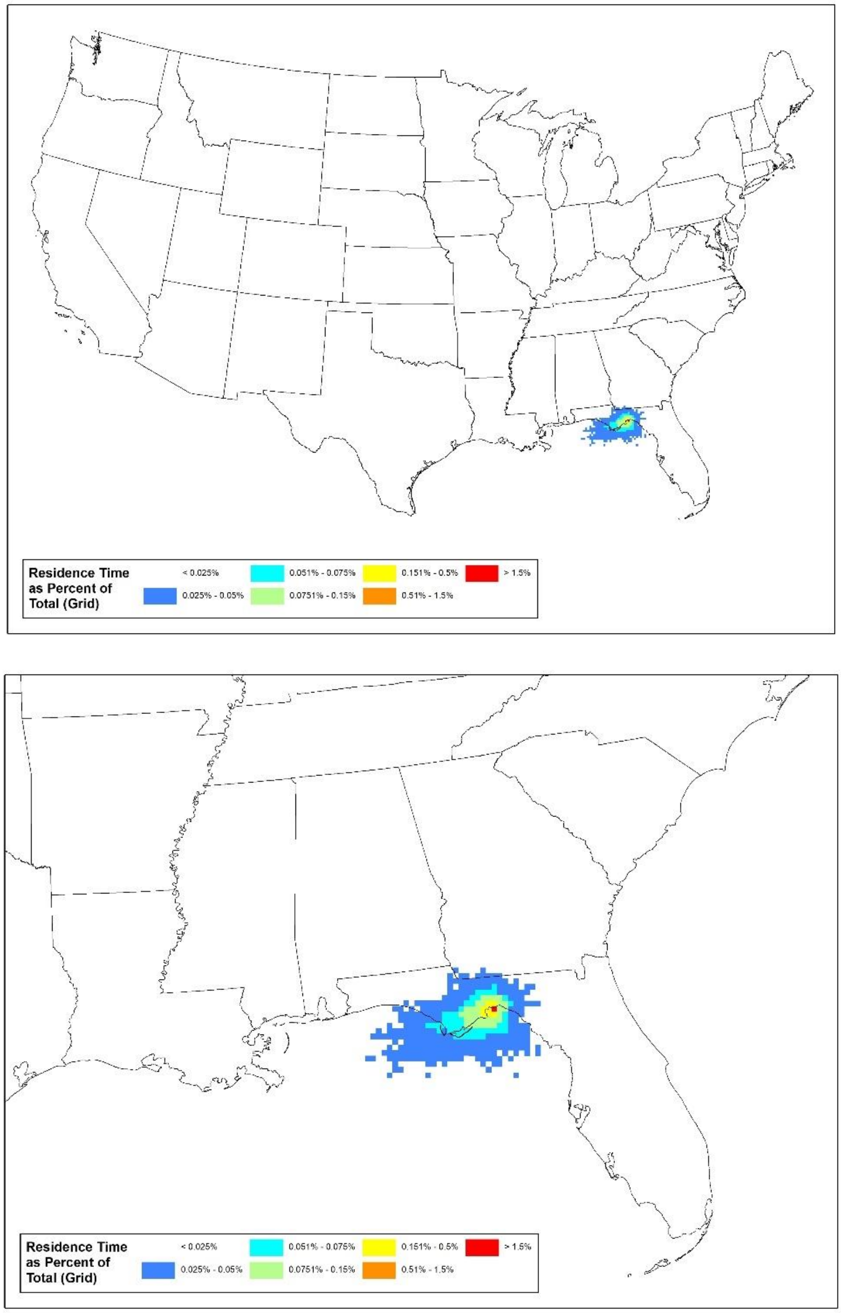


Figure 7-40: Residence Time (% of Total Counts per 12km Modeling Grid Cell for St. Marks – Full View (top) and Class I Zoom (bottom)

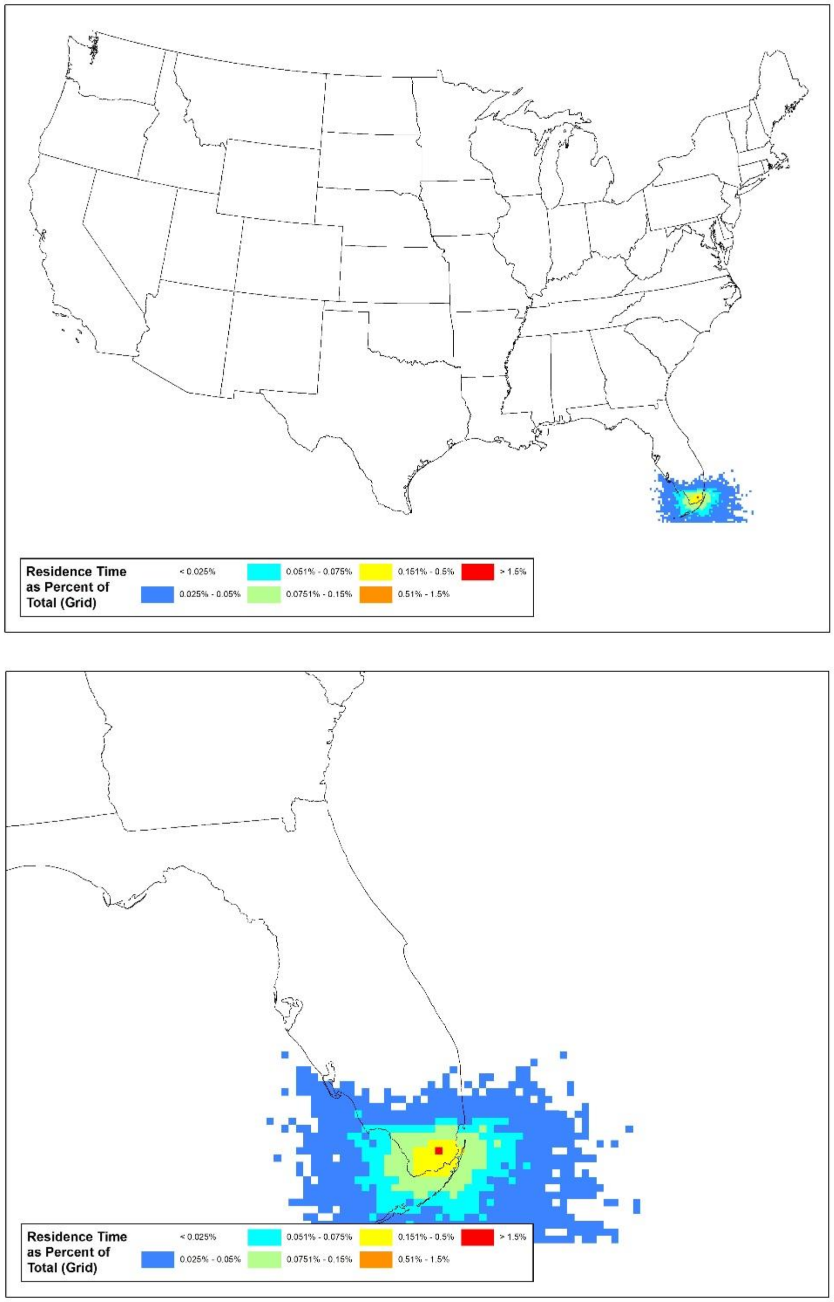


Figure 7-41: Residence Time (% of Total Counts per 12km Modeling Grid Cell for Everglades – Full View (top) and Class I Zoom (bottom)

7.5.3. Extinction-Weighted Residence Time Plots

The next step was to develop sulfate and nitrate extinction-weighted residence time (EWRT) plots. Each back trajectory was weighted by ammonium sulfate and ammonium nitrate extinction for that day and used to produce separate sulfate and nitrate EWRT plots. This allows separate analyses for sulfate and nitrate.

The concentration weighted trajectory (CWT)[52] approach was used to develop the EWRT, substituting the extinction values for the concentration. The extinction attributable to each pollutant is paired with the trajectory for that day. The mean weighted extinction of the pollutant species for each grid cell is calculated according to the following formula:

$$\overline{E}ij = EWRT = \frac{1}{\sum_{k=1}^{N} \tau_{ijk}} \sum_{k=1}^{N} (bext_k)\tau_{ijk}$$

Where:

- i and j are the indices of the grid;
- k is the index of the trajectory;
- N is the total number of trajectories used in the analysis;
- b_{ext} is the 24-hour extinction attributed to the pollutant measured upon arrival of trajectory k; and
- τ_{ijk} is the number of trajectory hours that pass through each grid cell (i, j), where i is the row and j is the column.

The higher the value of the EWRT ($\overline{E}_{ij}$), the more likely that the air parcels passing over cell (i, j) would cause higher extinction at the receptor site for that light extinction species. Since this method uses the extinction value for weighting, trajectories passing over large sources are more discernible than those passing over moderate sources.

Figure 7-42, Figure 7-43, and Figure 7-44 contain the sulfate extinction weighted residence time (sulfate EWRT per 12-km modeling grid cell) for Chassahowitzka, St. Marks, and Everglades, respectively, for the 20% most impaired days from 2011 to 2016. Figure 7-45, Figure 7-46, and Figure 7-47 contain the nitrate extinction weighted residence time (nitrate EWRT per 12-km modeling grid cell) for Chassahowitzka, St. Marks, and Everglades, respectively, for the 20% most impaired days from 2011 to 2016. It should be noted that the sulfate extinction weighted residence times are significantly higher (approximately ten times higher) than the nitrate extinction weighted residence times, demonstrating the importance of focusing on SO_2 emission reductions.

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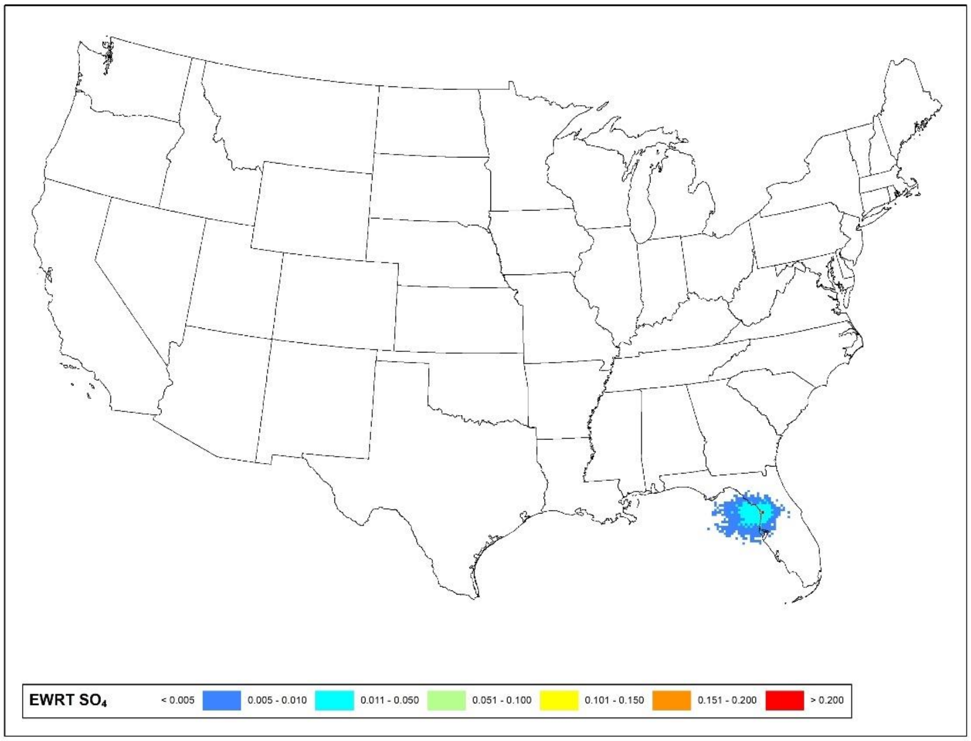
[52] Hsu, Y.-K., T. M. Holsen and P. K. Hopke (2003). "Comparison of hybrid receptor models to locate PCB sources in Chicago". In: Atmospheric Environment 37.4, pp. 545–562. DOI: 10.1016/S1352-2310(02)00886-5



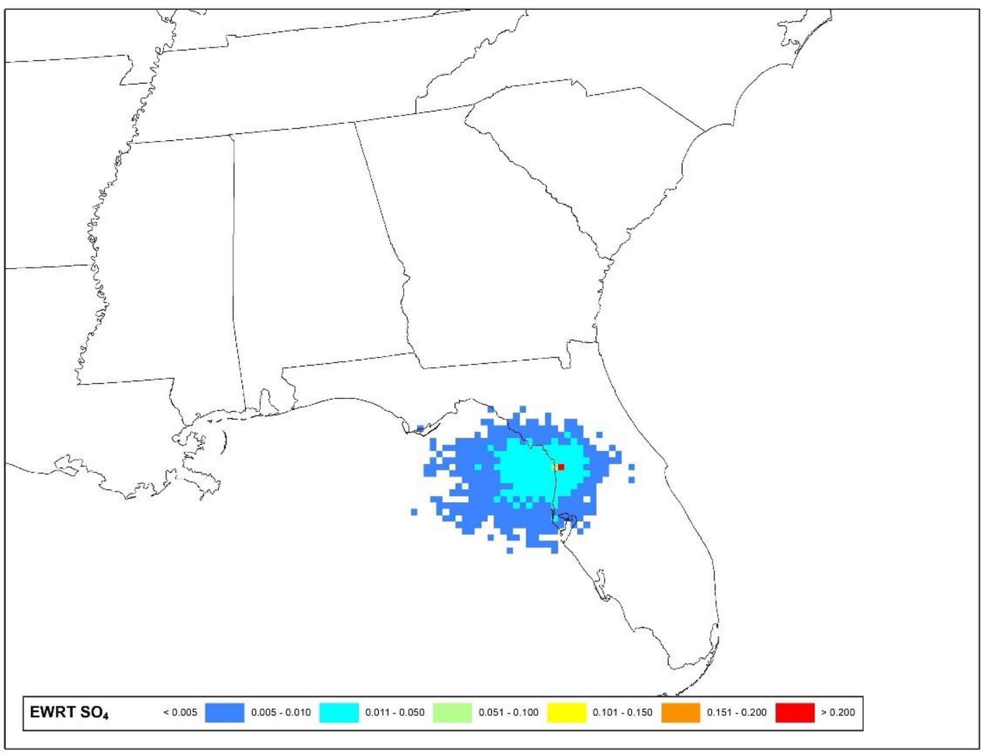
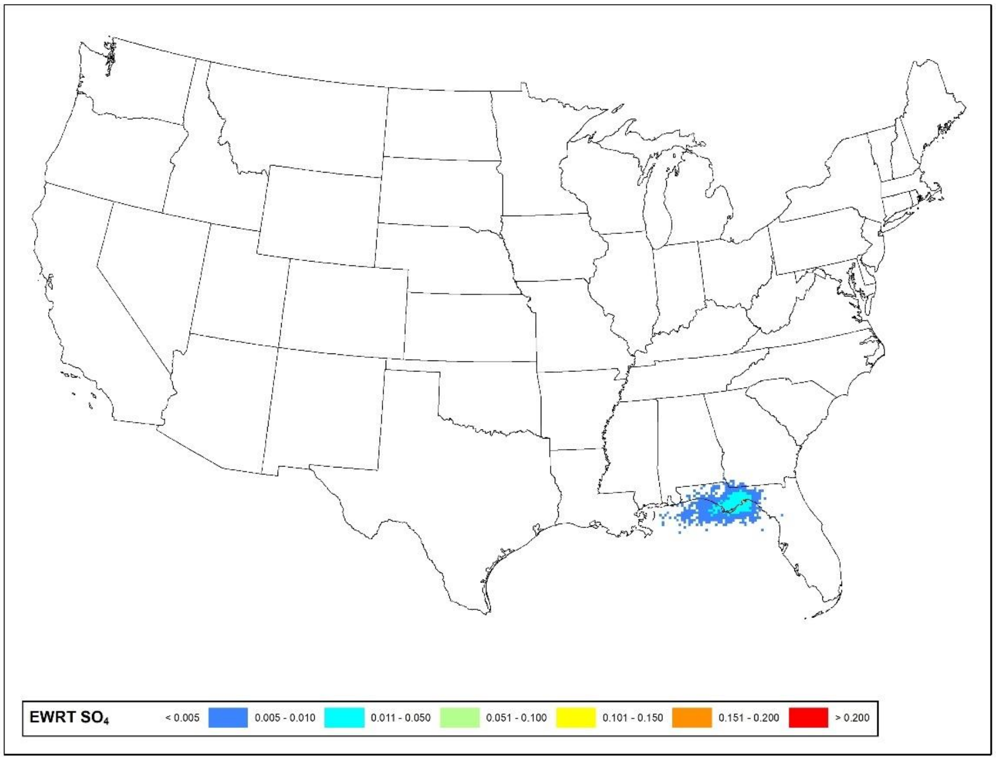


Figure 7-42: Sulfate Extinction Weighted Residence Time (Sulfate EWRT per 12km Modeling Grid Cell) for Chassahowitzka - Full View (top) and Class I Zoom (bottom)



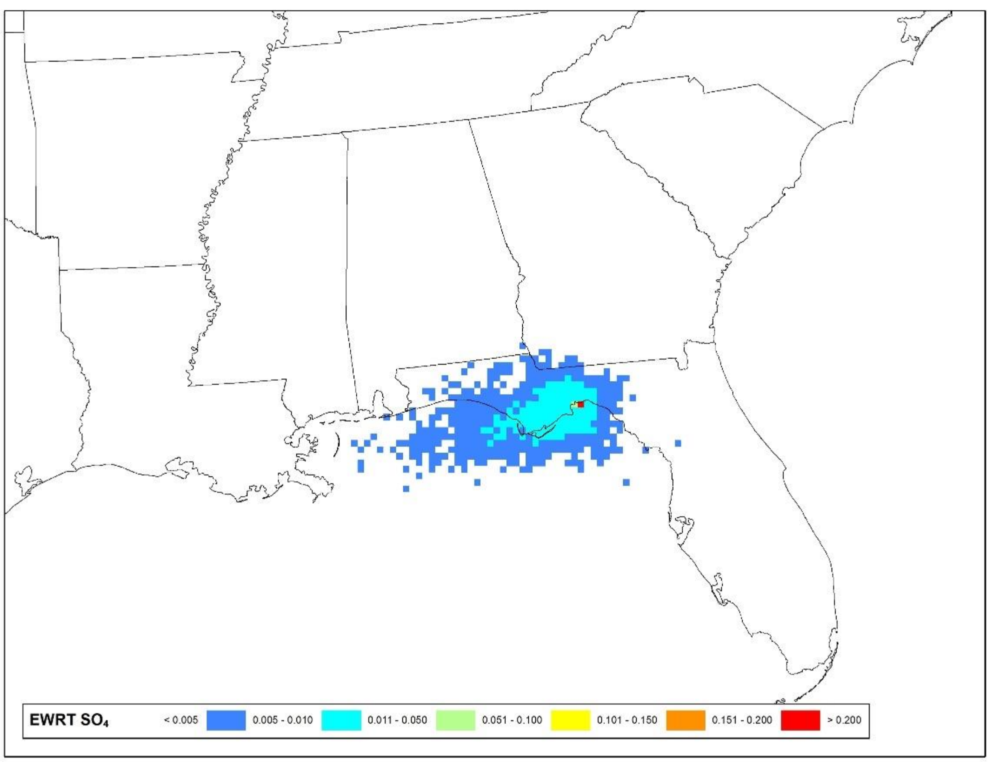
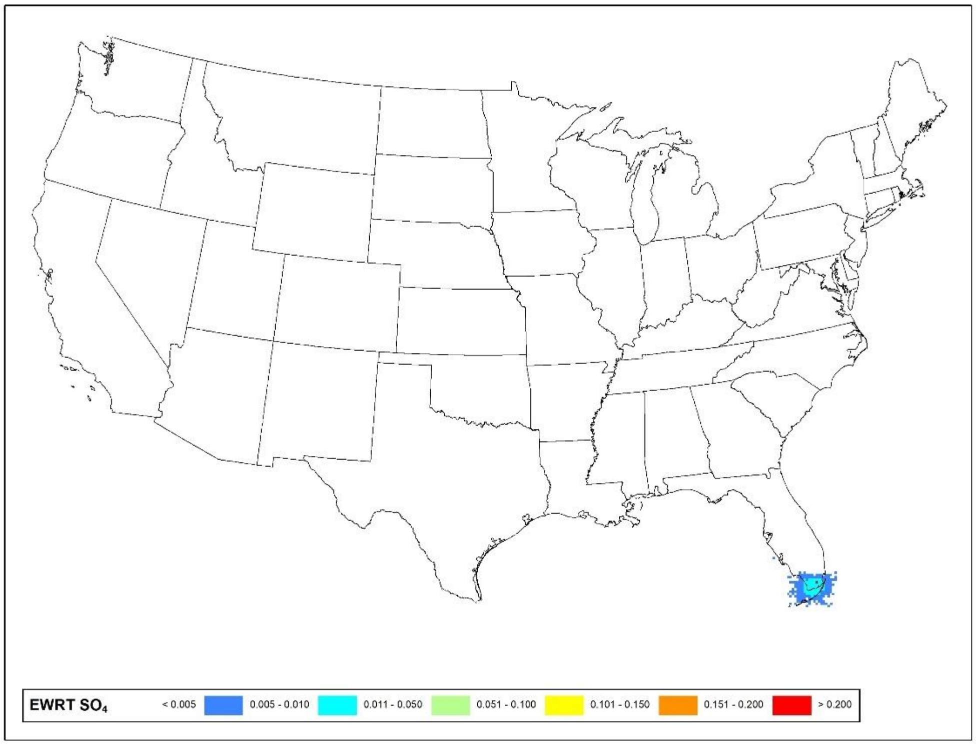


Figure 7-43: Sulfate Extinction Weighted Residence Time (Sulfate EWRT per 12km Modeling Grid Cell) for St. Marks - Full View (top) and Class I Zoom (bottom)



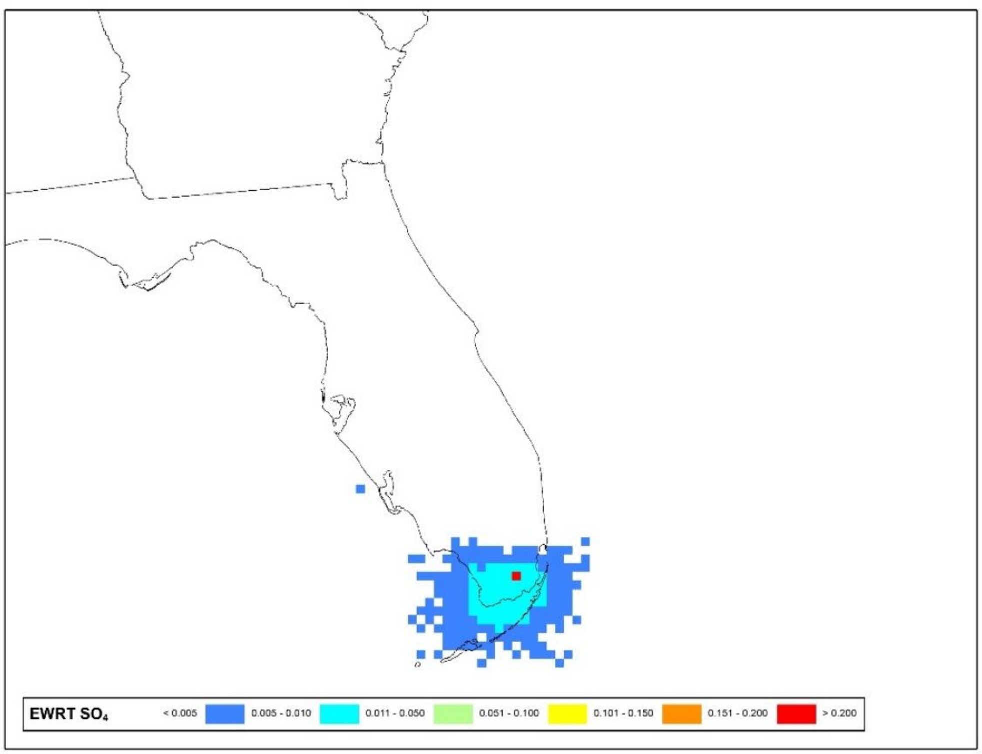
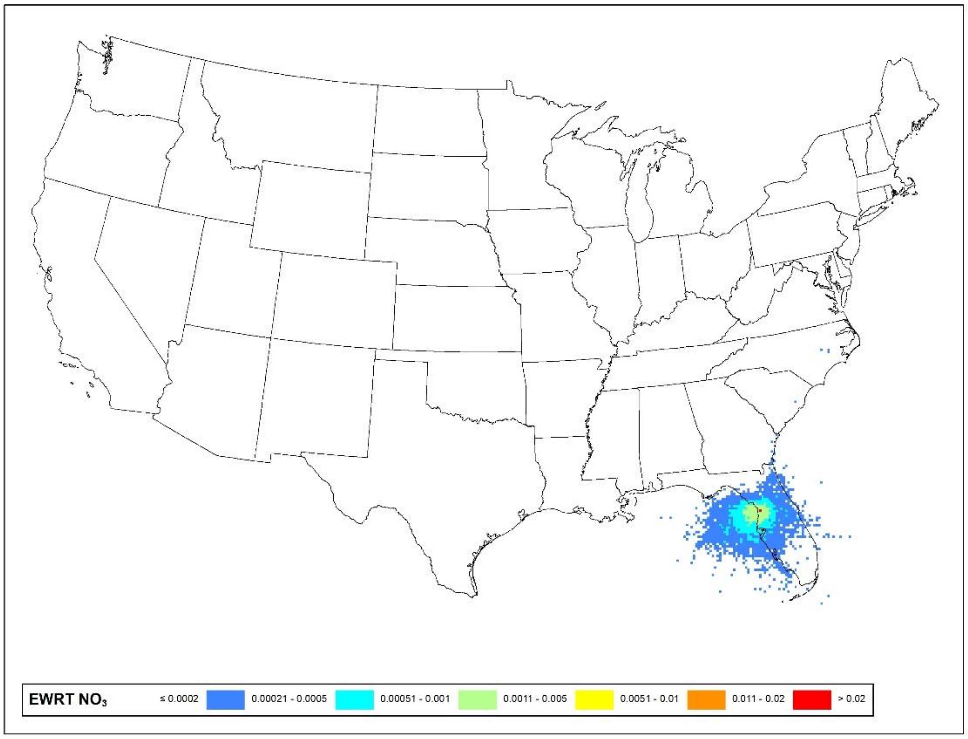


Figure 7-44: Sulfate Extinction Weighted Residence Time (Sulfate EWRT per 12km Modeling Grid Cell) for Everglades - Full View (top) and Class I Zoom (bottom)



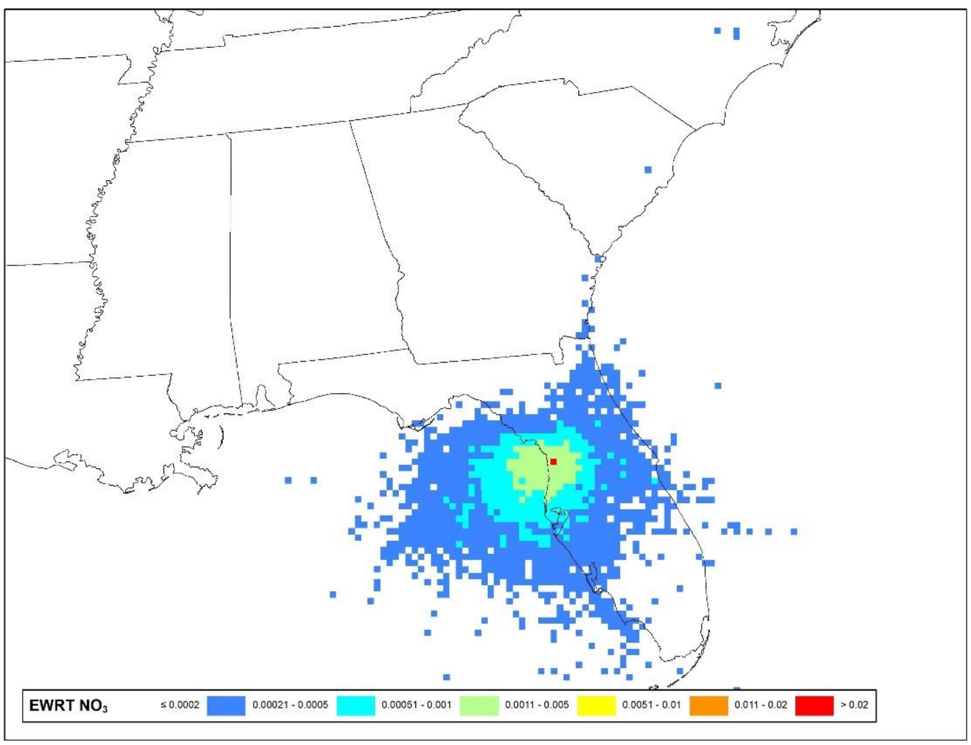
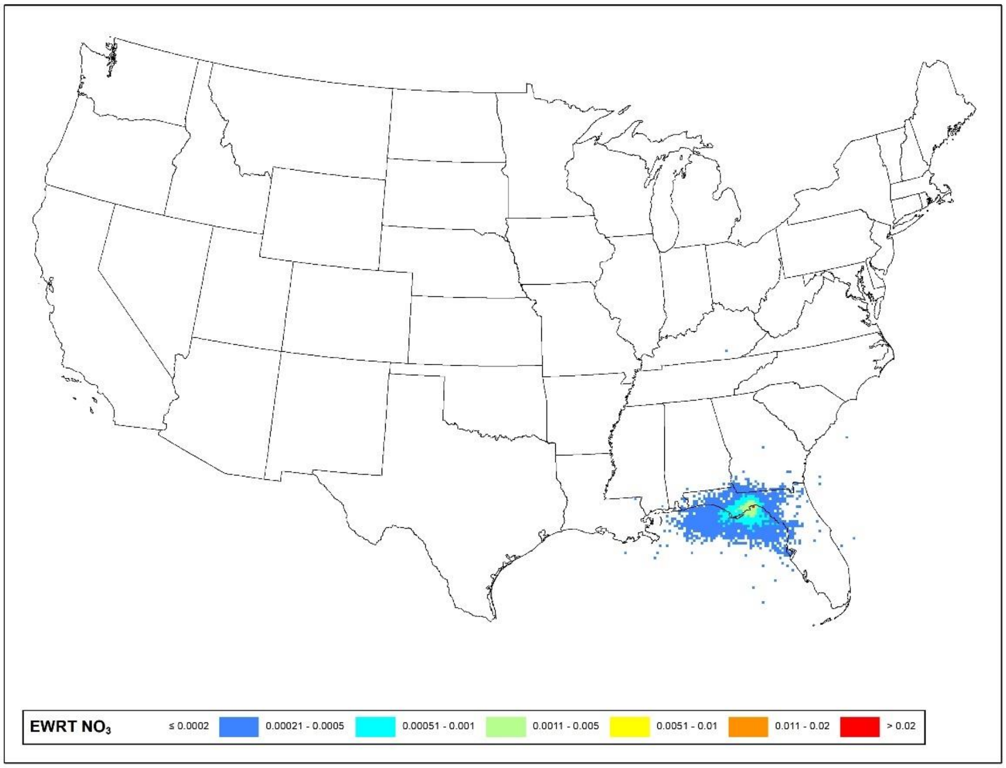


Figure 7-45: Nitrate Extinction Weighted Residence Time (Nitrate EWRT per 12-km Modeling Grid Cell) for Chassahowitzka - Full View (top) and Class I Zoom (bottom)



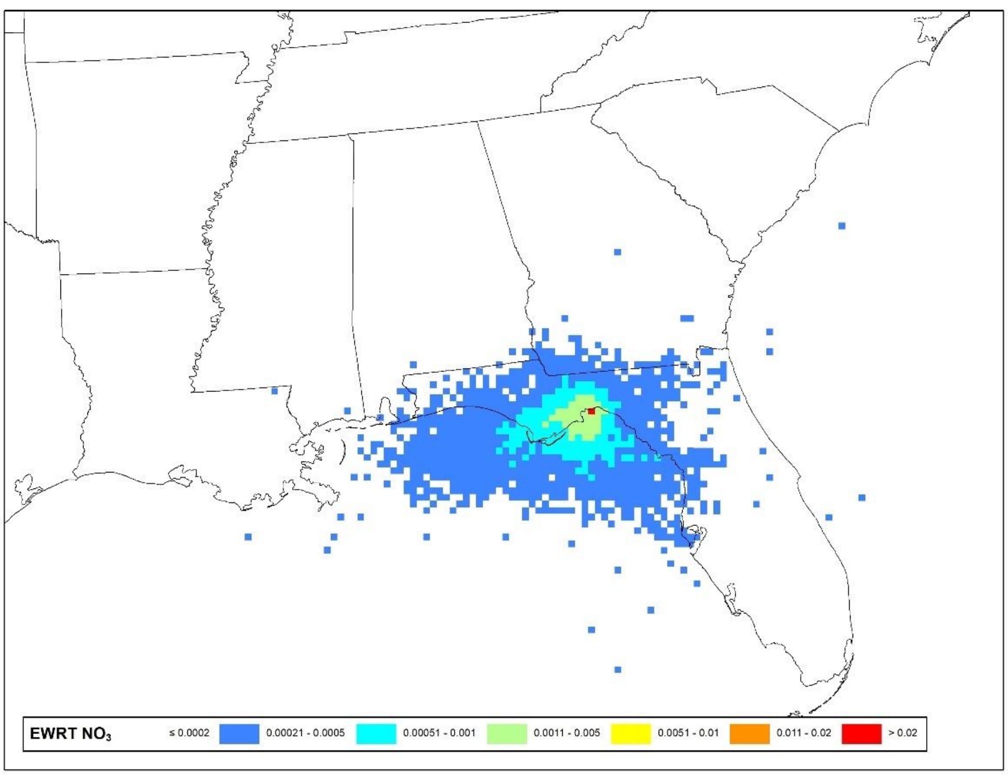


Figure 7-46: Nitrate Extinction Weighted Residence Time (Nitrate EWRT per 12-km Modeling Grid Cell) for St. Marks - Full View (top) and Class I Zoom (bottom)

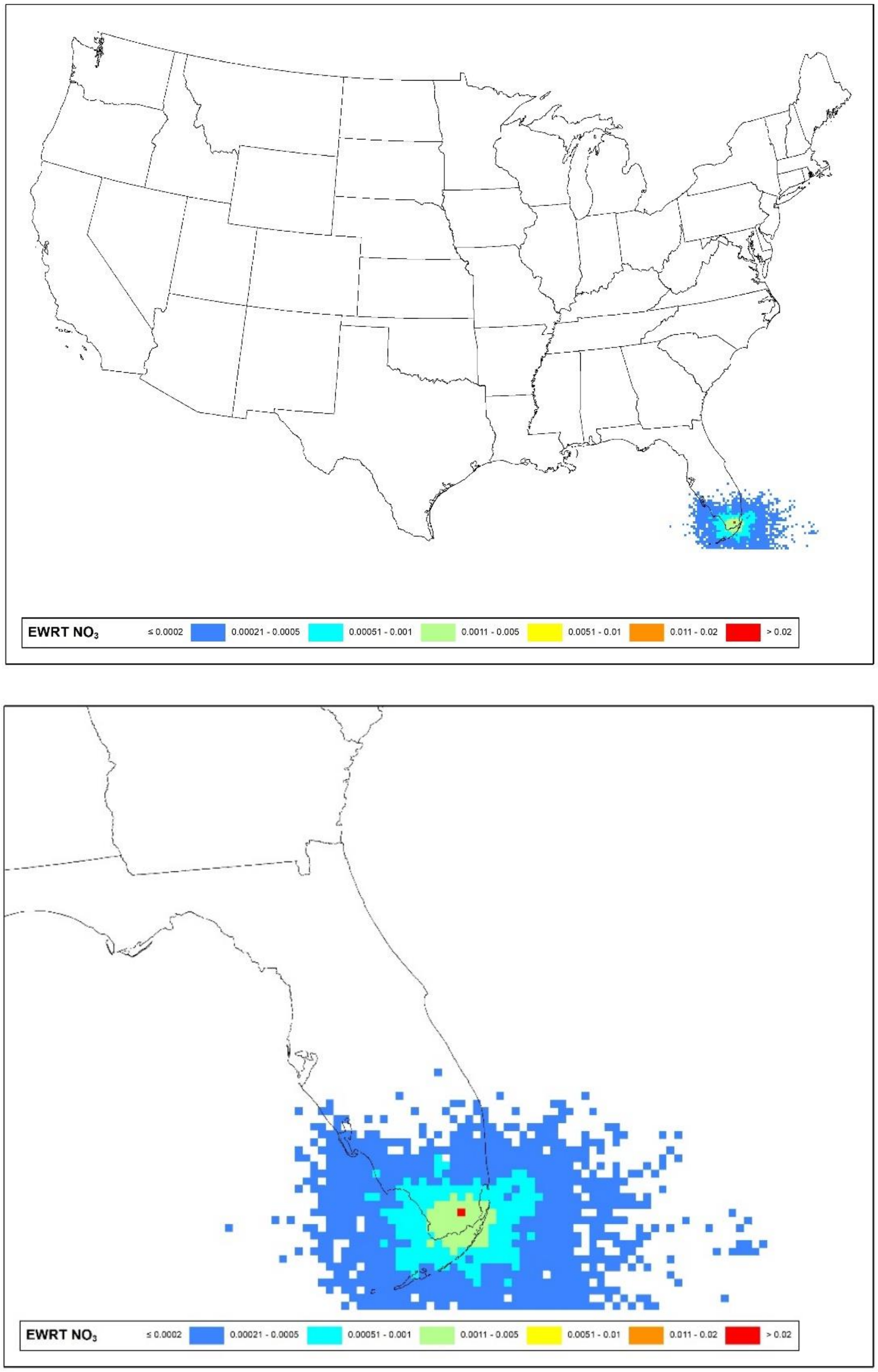


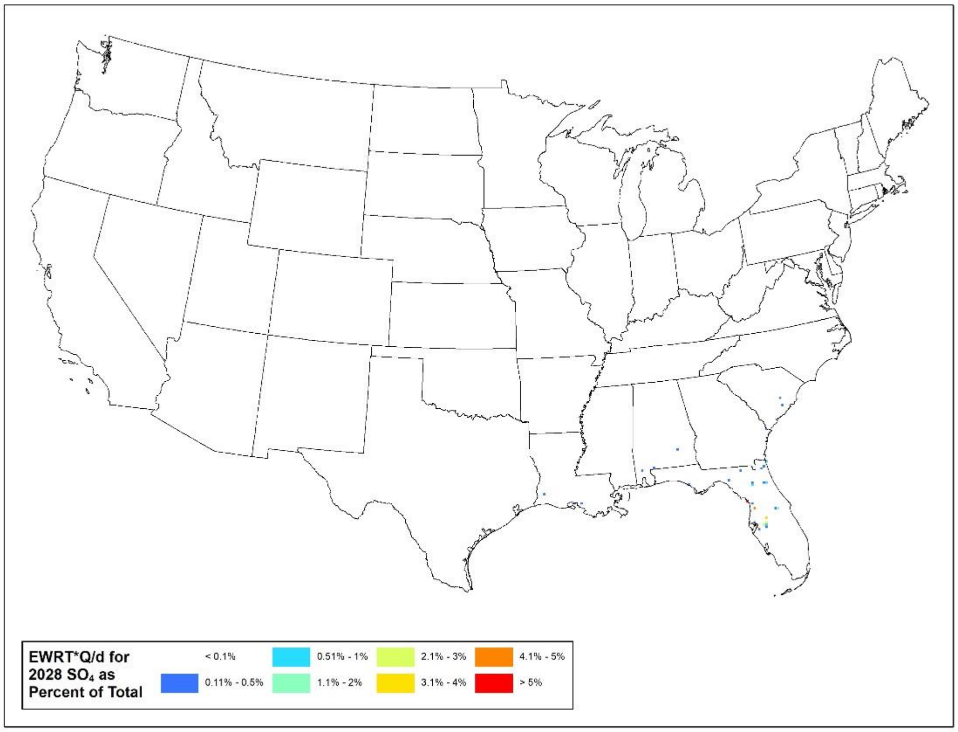
Figure 7-47: Nitrate Extinction Weighted Residence Time (Nitrate EWRT per 12-km Modeling Grid Cell) for Everglades - Full View (top) and Class I Zoom (bottom)

7.5.4. Emissions/Distance Extinction Weighted Residence Time Plots

Extinction weighted residence times were then combined with 12-km gridded SO_2 and NO_X emissions from the 2028 emissions inventory. As a way of incorporating the effects of transport, deposition, and chemical transformation of point source emissions along the path of the trajectories, these data were weighted by 1/d, where d was calculated as the distance, in kilometers, between the center of the grid cell in which a source is located and the center of the grid cell in which the IMPROVE monitor is located. For Class I areas without an IMPROVE monitor (WOLF, JOYC, and OTCR), the grid cell for the centroid of the Class I area was used.

The grid cell total point SO_2 or NO_X emissions (Q, in tons per year) were divided by the distance (d, in kilometers) to the trajectory origin; for a final value (Q/d). This value was then multiplied by the sulfate or nitrate EWRT grid values (i.e., EWRT*(Q/d)) on a grid cell by grid cell basis. Next, the sulfate and nitrate EWRT *(Q/d) values were normalized by the domain-wide total and displayed as a percentage. This information allows the individual facilities to be ranked from highest to lowest based on sulfate and/or nitrate contributions. It should be noted that if non-normalized EWRT*(Q/d) values had been used to rank facilities from highest to lowest, the order would have been identical to the ranking from the normalized EWRT*(Q/d) values.

Figure 7-48, Figure 7-49, and Figure 7-50 contain the sulfate emissions/distance extinction weighted residence time (percent of total Q/d*EWRT per 12-km modeling grid cell) for Chassahowitzka, St. Marks, and Everglades, respectively. Figure 7-51, Figure 7-52, and Figure 7-53 contain the nitrate emissions/distance extinction weighted residence time (percent of total Q/d*EWRT per 12-km modeling grid cell) Chassahowitzka, St. Marks, and Everglades, respectively. These maps help visualize where the sources of the largest visibility impacts are located. These figures illustrate the relative importance of Florida sources of SO_2 and NO_X, respectively, compared to sources in neighboring states.



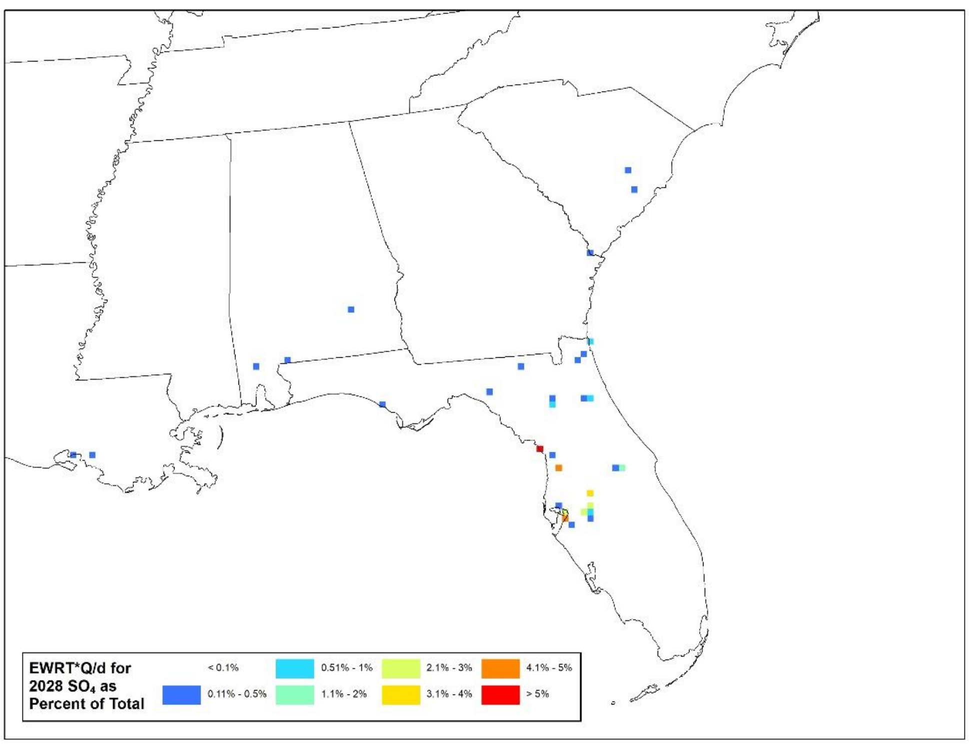


Figure 7-48: Sulfate Emissions/Distance Extinction Weighted Residence Time (% of Total Q/d*EWRT per 12km Modeling Grid Cell) for Chassahowitzka – Full View (top) and Class I Zoom (bottom)

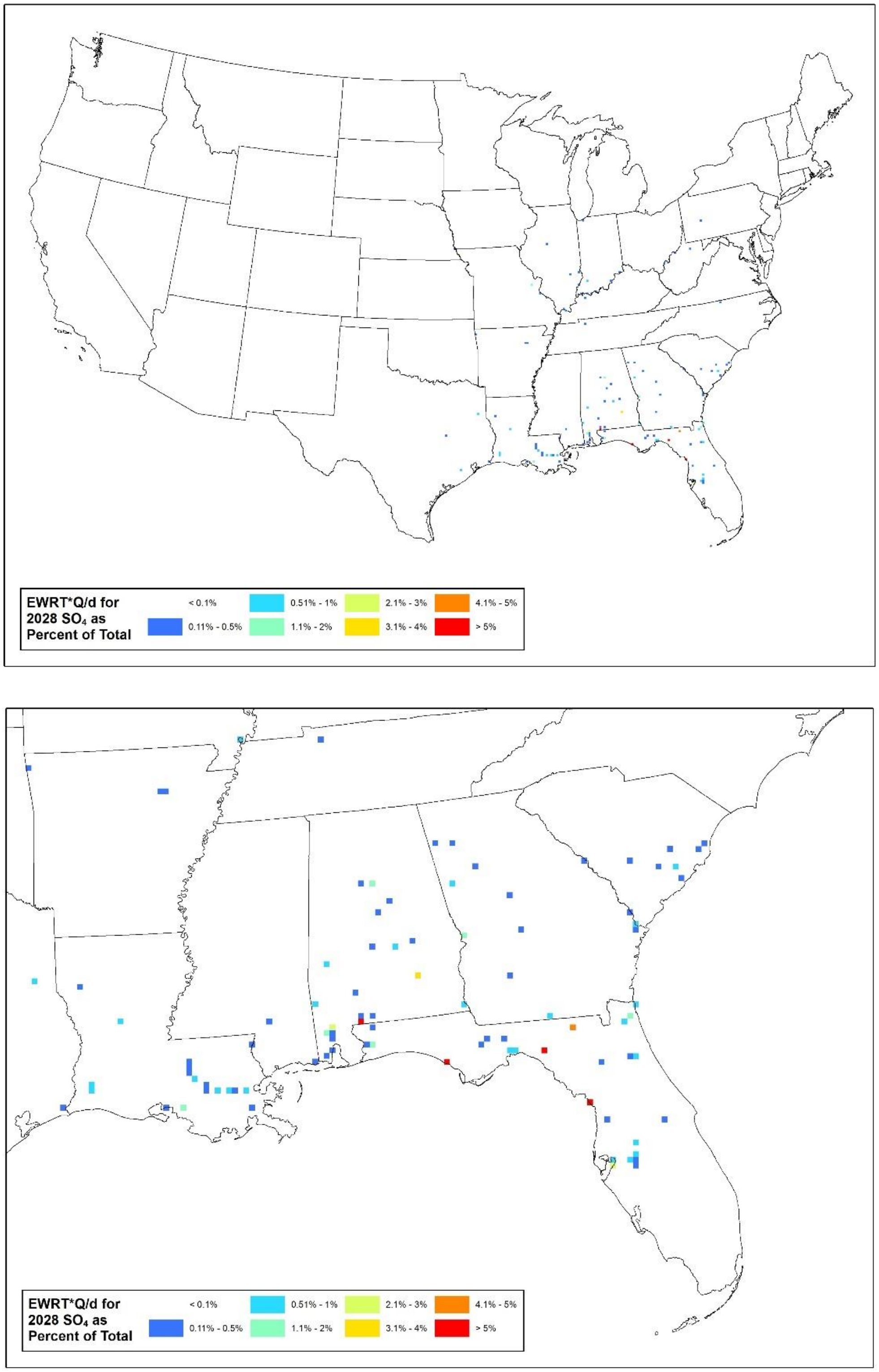
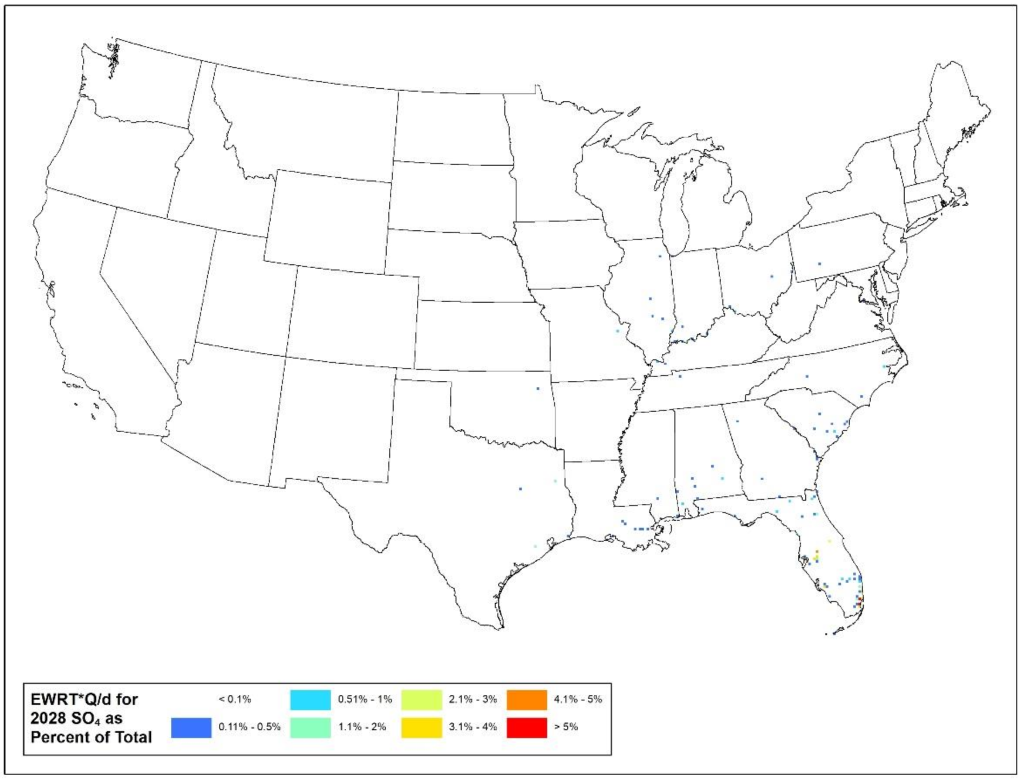


Figure 7-49: Sulfate Emissions/Distance Extinction Weighted Residence Time (% of Total Q/d*EWRT per 12km Modeling Grid Cell) for St. Marks – Full View (top) and Class I Zoom (bottom)



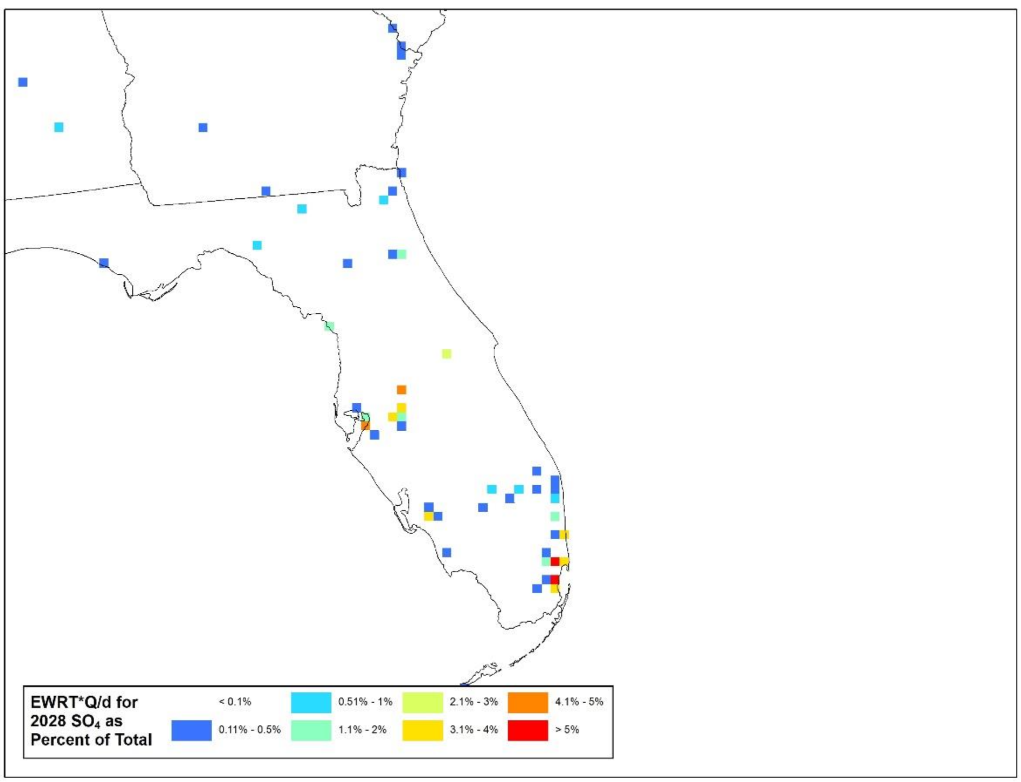
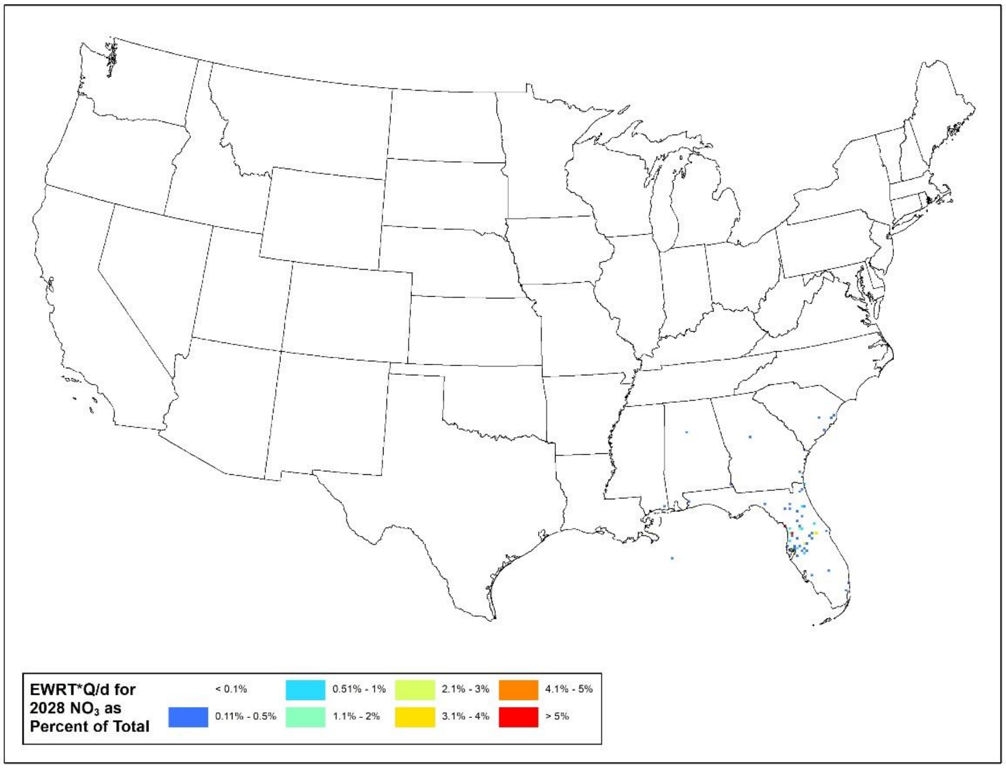


Figure 7-50: Sulfate Emissions/Distance Extinction Weighted Residence Time (% of Total Q/d*EWRT per 12km Modeling Grid Cell) for Everglades – Full View (top) and Class I Zoom (bottom)



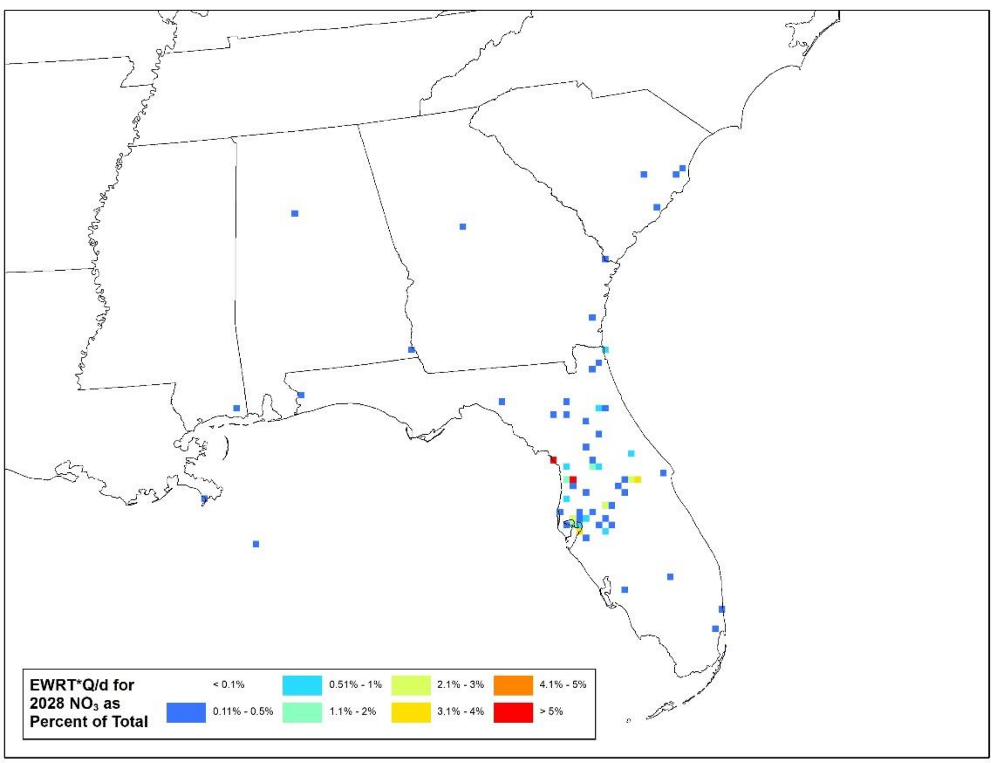


Figure 7-51: Nitrate Emissions/Distance Extinction Weighted Residence Time (% of Total Q/d*EWRT per 12km Modeling Grid Cell) for Chassahowitzka – Full View (top) and Class I Zoom (bottom)

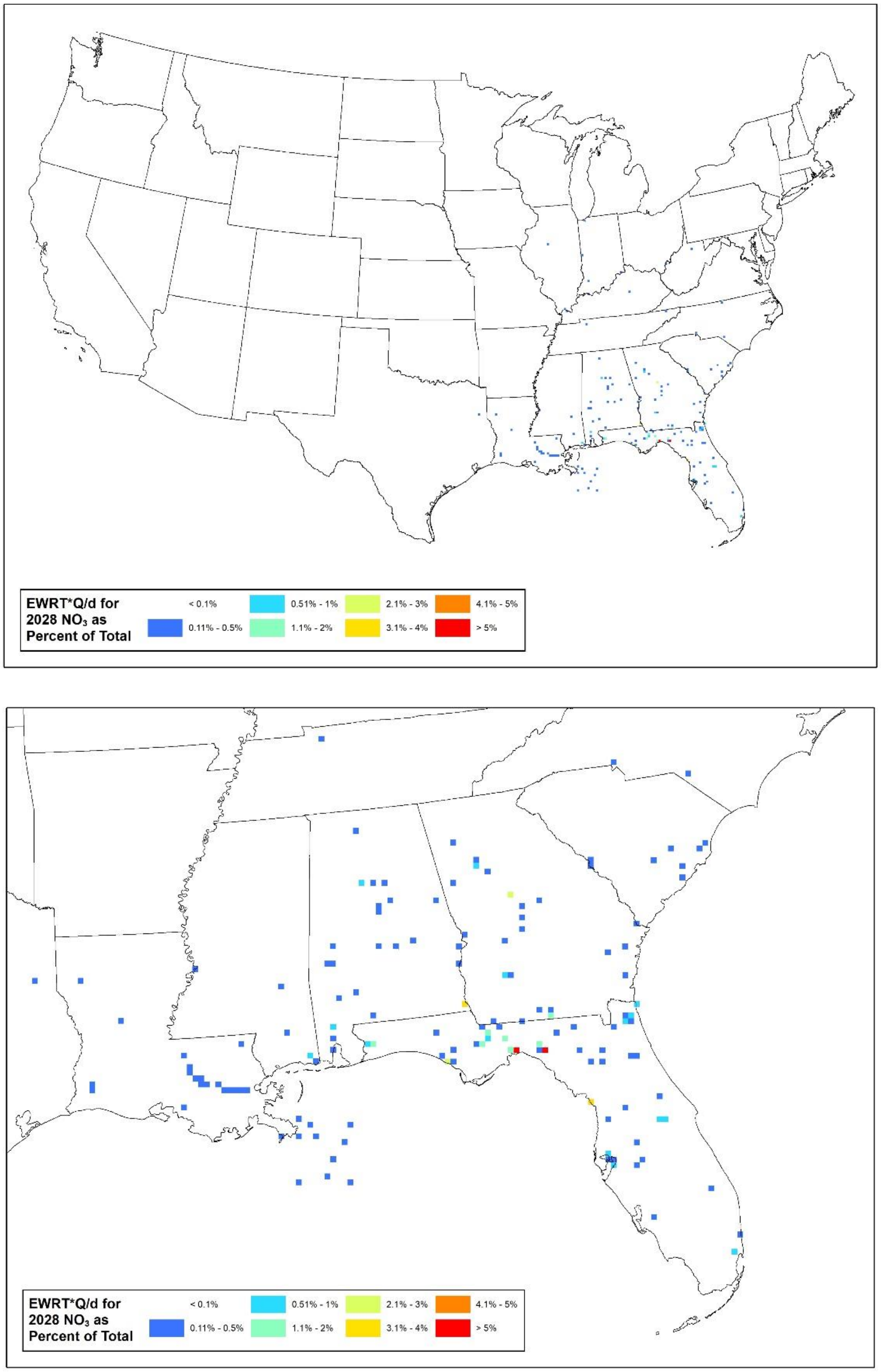
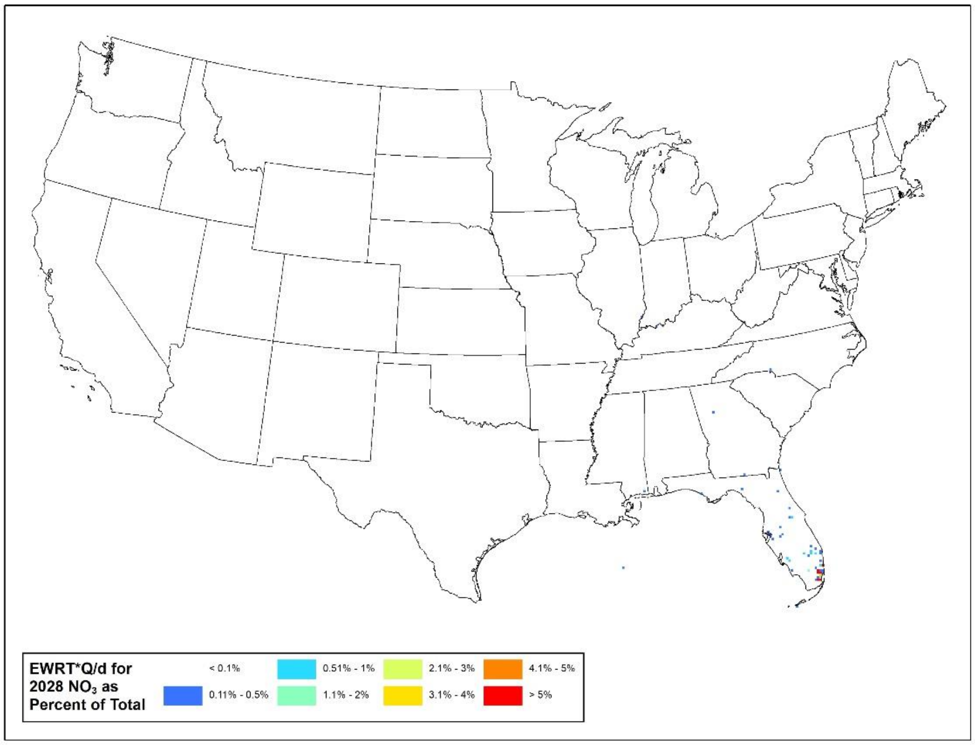


Figure 7-52: Nitrate Emissions/Distance Extinction Weighted Residence Time (% of Total Q/d*EWRT per 12km Modeling Grid Cell) for St. Marks – Full View (top) and Class I Zoom (bottom)



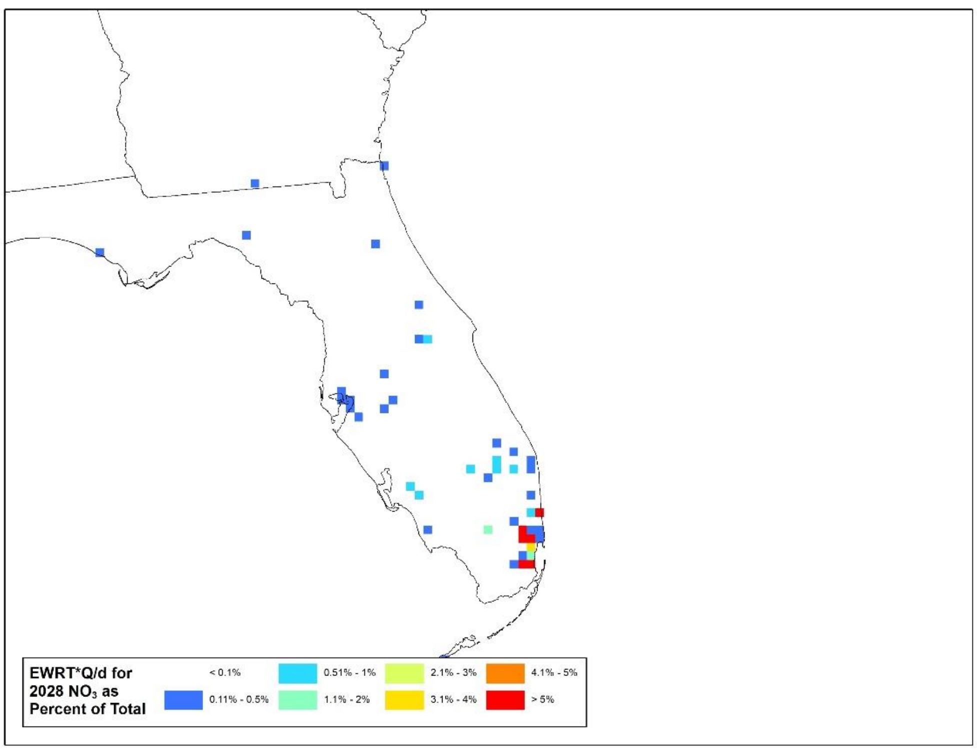


Figure 7-53: Nitrate Emissions/Distance Extinction Weighted Residence Time (% of Total Q/d*EWRT per 12km Modeling Grid Cell) for Everglades – Full View (top) and Class I Zoom (bottom)

7.5.5. Ranking of Sources for Florida Class I Areas

The Q/d*EWRT data was further paired with additional point source metadata that defined the facility. Such data included facility identification numbers, facility names, state and county of location, Federal Information Processing Standard (FIPS) codes, North American Industry Classification System (NAICS) codes, and industry description. Spreadsheets for individual Class I areas were then exported from the database for further analysis by the states. This information allows the individual facilities to be ranked from highest to lowest based on sulfate and/or nitrate contributions.

It should be noted that while point sources account for most of the sulfate extinction, these sources only account for a portion of the nitrate extinction. Much of the nitrate extinction can be attributable to the onroad and nonpoint sectors. As such, a similar analysis for county level data was conducted, that included county total point source contributions. This allows the point source contribution to be directly compared to the other source categories.

Similar analyses were conducted to rank SO_2 and NO_X emissions contributions for the county-level sources (nonpoint, onroad, non-road, fires, and total point source sectors). The process was similar to the process for point sources previously described, except calculations of RT and EWRT were completed at the county-level as opposed to grid cells. The calculation of "d" was from the centroid of the county to the trajectory origin, in km. Similar to point sources, the final spatial join was made between the county-level EWRT, emissions, and source information for each sector.

Table 7-5 contains the NO_X and SO_2 source contributions to visibility impairment on the 20% most impaired days at Chassahowitzka. Table 7-6 contains the NO_X and SO_2 source contributions to visibility impairment on the 20% most impaired days at St. Marks. Based on these contributions, it is clear that SO_2 from point sources is the dominant source category at Chassahowitzka (86.43%) and St. Marks (52.12%).

Table 7-7 contains the NO_X and SO_2 source contributions to visibility impairment on the 20% most impaired days at Everglades. At Everglades, point sources contribute a smaller amount to visibility impairment compared to other Class I areas. As discussed previously in Section 7.4, this is due to the unique mix of sources around Everglades compared to other areas in Florida and across VISTAS, with the largest point sources located farther from Everglades, and more significant impacts from airports, offshore marine vessels, and onroad and nonroad sources compared to other Class I areas.

Table 7-5: NO_X and SO_2 Source Contributions to Visibility Impairment on the 20% Most Impaired Days at Chassahowitzka

Category	NO_X	SO_2	Total
Nonpoint	0.58%	0.58%	1.16%
Non-Road, MAR	0.41%	0.12%	0.53%
Non-Road, Other	1.46%	0.07%	1.54%
Onroad	2.13%	0.28%	2.41%
Point	4.76%	86.43%	91.18%
Pt_Fires_Prescribed	0.49%	2.70%	3.19%
Total	9.82%	90.18%	100.00%

Table 7-6: NO_X and SO_2 Source Contributions to Visibility Impairment on the 20% Most Impaired Days at St. Marks

Category	NO_X	SO_2	Total
Nonpoint	1.69%	3.13%	4.82%
Non-Road, MAR	1.70%	0.56%	2.26%
Non-Road, Other	2.56%	0.33%	2.89%
Onroad	3.80%	0.61%	4.41%
Point	5.31%	52.12%	57.43%
Pt_Fires_Prescribed	3.41%	24.77%	28.18%
Total	18.47%	81.53%	100.00%

Table 7-7: NO_X and SO_2 Source Contributions to Visibility Impairment on the 20% Most Impaired Days at Everglades

Category	NO_X	SO_2	Total
Nonpoint	6.64%	5.60%	12.24%
Non-Road, MAR	24.01%	13.36%	37.37%
Non-Road, Other	12.90%	0.44%	13.34%
Onroad	17.77%	2.08%	19.85%
Point	7.75%	7.09%	14.84%
Pt_Fires_Prescribed	0.45%	1.90%	2.35%
Total	69.52%	30.48%	100.00%

In order to compare the contributions from counties on a relative basis, an additional analysis was conducted by adding new columns to normalize the EWRT*(Q/d) by the area of each county to develop a metric to compare the contributions from counties on a relative basis. The previous calculation (prior to being normalized by area) had a propensity to attribute higher contributions to larger counties simply because they typically contained more emission sources and more hourly trajectory end points. Normalizing the contribution by the area of the county (i.e., EWRT*(Q/d) per square kilometer) provides a sense of the source emission density within the county. This allows county contributions to be directly compared, without large counties being weighted more heavily by simply having more emission sources and more hourly trajectory end points. County contributions (normalized or non-normalized by area) are found in Appendix D.

All county and emissions source identifying information were joined in an Access database with calculations of Q/d, EWRT, EWRT*(Q/d), fraction and sum contributions, and any other source information. The database was then used to generate individual spreadsheets for each Class I area.

Table 7-8 contains the AoI NO_X and SO_2 facility contributions to visibility impairment on the 20% most impaired days at Chassahowitzka. Table 7-9 contains the AoI NO_X and SO_2 facility contributions to visibility impairment on the 20% most impaired days at St. Marks. Table 7-10 contains the AoI NO_X and SO_2 facility contributions to visibility impairment on the 20% most impaired days at Everglades. These tables only show the facilities contributing more than 1.00% sulfate + nitrate. The full list of all facilities can be found in Appendix D. The lists of individual facilities identified by the AoI analysis for each Class I area were used to determine which facilities were tagged in the PSAT source contribution analysis.

Table 7-8: AoI NO_X and SO_2 Facility Contributions to Visibility Impairment on the 20% Most Impaired Days at Chassahowitzka

State	Facility ID	Facility Name	Distance (km)	2028 NO_X (tpy)	2028 SO_2 (tpy)	Nitrate (%)	Sulfate (%)	Sulfate + Nitrate (%)
FL	12017-640611	DUKE CRYSTAL RIVER	27.4	2,489.8	5,306.4	1.95%	63.62%	65.57%
FL	12053-716011	CENTRAL POWER AND LIME	21.5	631.6	235.0	1.05%	4.31%	5.36%
FL	12057-538611	TECO BIG BEND	106.8	2,665.0	6,084.9	0.24%	4.73%	4.96%
FL	12105-643111	LAKELAND C.D. MCINTOSH, JR. POWER PLANT	96.1	1,765.3	4,202.2	0.12%	3.12%	3.24%
FL	12105-717711	MOSAIC NEW WALES	112.6	310.4	3,581.0	0.02%	2.09%	2.11%
FL	12057-716411	MOSAIC FERTILIZER RIVERVIEW	99.7	159.7	1,890.0	0.02%	2.01%	2.03%
FL	12105-919811	MOSAIC FERTILIZER BARTOW	112.2	141.0	3,614.0	0.01%	1.90%	1.91%
FL	12095-845411	OUC STANTON	138.8	4,033.4	2,690.6	0.19%	1.19%	1.37%

Table 7-9: AoI NO_X and SO_2 Facility Contributions to Visibility Impairment on the 20% Most Impaired Days at St. Marks

State	Facility ID	Facility Name	Distance (km)	2028 NO_X (tpy)	2028 SO_2 (tpy)	Nitrate (%)	Sulfate (%)	Sulfate + Nitrate (%)
FL	12005-535411	WESTROCK PANAMA CITY MILL	140.8	1,404.9	2,590.9	0.24%	8.54%	8.78%
FL	12123-752411	FOLEY CELLULOSE PERRY MILL	61.4	1,830.7	1,520.4	0.51%	6.65%	7.16%
AL	01053-7440211	ESCAMBIA OPERATING COMPANY LLC	325.6	349.3	7,963.0	0.01%	5.95%	5.96%
FL	12017-640611	DUKE CRYSTAL RIVER	189.3	2,489.8	5,306.4	0.24%	5.45%	5.69%
FL	12047-769711	NUTRIEN WHITE SPRINGS AG CHEM, INC	137.7	112.4	2,745.0	0.01%	4.34%	4.35%
AL	01109-985711	SANDERS LEAD CO	255.9	121.7	7,951.1	0.00%	3.06%	3.06%
FL	12057-538611	TECO BIG BEND	307.1	2,665.0	6,084.9	0.07%	1.90%	1.97%
AL	01097-1056111	ALA POWER - BARRY	383.1	2,181.9	6,025.6	0.03%	1.67%	1.71%
FL	12033-752711	GULF CLEAN ENERGY CENTER (CRIST)	299.5	2,998.4	2,615.7	0.08%	1.49%	1.57%
FL	12129-2731711	TALLAHASSEE PURDOM GENERATING STA.	8.7	121.5	2.9	1.00%	0.52%	1.52%
GA	13099-931711	GEORGIA-PACIFIC CORP CEDAR SPRINGS OPERATION	149.2	2,884.2	510.1	0.29%	0.88%	1.17%
AL	01097-1061611	UNION OIL OF CALIFORNIA - CHUNCHULA GAS PLANT	396.3	349.2	2,573.2	0.01%	1.15%	1.15%
LA	22101-8020311	COLUMBIAN CHEMICALS CO - NORTH BEND PLANT	705.9	640.3	7,834.0	0.00%	1.11%	1.12%
FL	12031-640211	JEA NORTHSIDE	253.7	651.8	2,094.5	0.03%	1.07%	1.10%
MO	29071-6032111	AMEREN MISSOURI-LABADIE PLANT	1,121.8	9,685.5	41,740.3	0.01%	1.02%	1.02%

Table 7-10: AoI NO_X and SO_2 Facility Contributions to Visibility Impairment on the 20% Most Impaired Days at Everglades

State	Facility ID	Facility Name	Distance (km)	2028 NO_X (tpy)	2028 SO_2 (tpy)	Nitrate (%)	Sulfate (%)	Sulfate + Nitrate (%)
FL	12086-9806211	MIAMI INTL	58.62	4,371.9	424.9	14.07%	8.74%	22.81%
FL	12011-9791511	FORT LAUDERDALE/HOLLYWOOD	92.1	1,922.6	207.7	2.53%	2.02%	4.55%
FL	12086-641611	MIAMI-DADE WATER AND SEWER DEPARTMENT	38.1	50.5	61.1	0.44%	3.96%	4.39%
FL	12086-900011	FPL TURKEY POINT	35.4	170.6	13.0	2.49%	1.57%	4.06%
FL	12086-900111	CEMEX MIAMI CEMENT PLANT	50.8	910.4	29.5	2.93%	0.73%	3.65%
FL	12057-538611	TECO BIG BEND	316.6	2,665.0	6,084.9	0.08%	3.02%	3.10%
FL	12105-643111	LAKELAND C.D. MCINTOSH, JR. POWER PLANT	322.8	1,765.3	4,202.2	0.17%	2.84%	3.01%
FL	12086-3532711	HOMESTEAD CITY UTILITIES	22.7	97.1	0.0	2.48%	0.00%	2.48%
FL	12105-717711	MOSAIC NEW WALES	303.3	310.4	3,581.0	0.02%	2.26%	2.28%
FL	12105-919811	MOSAIC BARTOW	304.7	141.0	3,614.0	0.01%	2.21%	2.22%
FL	12086-641511	MIAMI-DADE WATER AND SEWER DEPARTMENT	66.1	51.2	131.8	0.12%	2.09%	2.21%
FL	12086-899911	TITAN-PENNSUCO	61.7	879.7	9.4	2.02%	0.16%	2.18%
FL	12071-8515111	WASTE MANAGEMENT INC. OF FLORIDA	173.2	5.8	390.4	0.00%	1.98%	1.98%
FL	12095-845411	OUC STANTON	346.1	4,033.4	2,690.6	0.25%	1.41%	1.66%
FL	12086-640011	MIAMI-DADE WATER AND SEWER DEPARTMENT	49.3	251.4	0.2	1.22%	0.01%	1.23%
TX	48401-Full_6146	MARTIN LAKE	1,552.8	12,358.3	56,110.3	0.01%	1.17%	1.18%
FL	12105-535711	MOSAIC RIVERVIEW	293.1	29.5	1,123.5	0.00%	1.17%	1.18%
FL	12011-3947211	WASTE MANAGEMENT INC. OF FLORIDA	112.0	64.5	175.3	0.06%	0.97%	1.03%
FL	12011-591711	FPL FORT LAUDERDALE	90.0	759.9	0.0	1.03%	0.00%	1.03%

7.6. Selection of Sources for Reasonable Progress Analysis

In order to gain a better understanding of the source contributions to modeled visibility, VISTAS used CAMx PSAT modeling. PSAT uses multiple tracer families to track the fate of both primary and secondary PM. PSAT allows emissions to be tracked (tagged) for individual facilities as well as various combinations of sectors and geographic areas (e.g., by state).

VISTAS states used the NO_X and SO_2 facility contributions from the AoI analysis to help identify sources to be tagged with PSAT. Each state submitted their list of facilities to be tagged. In the end, SO_2 and NO_X emissions for 87 individual facilities were tagged and the visibility contributions (Mm^{-1}) for the 20% most impaired days were determined at all Class I areas in the VISTAS_12 domain. In addition, PSAT tags previously discussed in Section 7.4 include total sulfate and nitrate contributions from EGU + non-EGU point sources at each Class I area. This allows a percent contribution (individual facility contribution divided by the total sulfate and nitrate contributions from EGU + non-EGU point sources) to be determined for each facility at each Class I area. If the sulfate contribution was greater than or equal to 1.00%, then the facility was considered for an SO_2 reasonable progress analysis. Nitrate contributions were also assessed; however, as discussed in Section 7.4, the Department focused on sulfates when screening and selecting facilities due to sulfates continuing to be the largest contributor to anthropogenic visibility impairment at all affected Class I areas. Details of the PSAT modeling can be found in Appendix E-7a and details of the percent contribution calculations can be found in Appendix E-7b.

7.6.1. Identification of Sources for PSAT Tagging

40 CFR 51.308(f)(2)(i) requires the state to "evaluate and determine the emission reduction measures that are necessary to make reasonable progress by considering the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected anthropogenic source of visibility impairment." Due to the continuing predominance of SO_2, as discussed in Section 7.4, Florida selected an AoI screening threshold that would include a reasonable number of large SO_2 sources in proximity to Class I areas in and around Florida. Florida used the NO_X and SO_2 facility contributions from the AoI analysis to help identify sources to be tagged with PSAT. Florida requested that all facilities both within and outside Florida with an individual AoI contribution of ≥5% for nitrates (individual facility nitrate contribution divided by total nitrate contributions from EGU + non-EGU point sources) or sulfates (individual facility sulfate contribution divided by total sulfate contributions from EGU + non-EGU point sources) at a Florida Class I area or any nearby Class I area be tagged with PSAT. This approach of looking at nitrate and sulfate contributions separately captured more sources for PSAT tagging than would have been captured using the approach of dividing by total sulfate plus nitrate contributions from

EGU + non-EGU point sources. Florida did not include airports for PSAT tagging even if they met the 5% threshold, because the Department does not have the authority to control emissions at airports. In addition, Florida also included four additional significant SO_2-emitting facilities for PSAT tagging on the basis that the facility emissions had changed significantly from what was used in the 2028 VISTAS modeling (Gulf Crist, Mosaic Bartow, Mosaic New Wales, and Mosaic Riverview), and therefore the PSAT results for these facilities could be used to adjust the 2028 visibility projections to account for these emissions changes. Based on all these criteria, Florida identified the sources listed in Table 7-11 for PSAT tagging based on the potential to impact Florida Class I areas, as well as the nearby Class I areas, Okefenokee and Wolf Island Wilderness Areas in Georgia. The Department considers this to be a reasonable set of sources captured in the initial screening step.[53]

Table 7-11: Facilities Selected by Florida for PSAT Tagging

State	Facility ID	Facility Name	NO_X and/or SO_2
AL	01053-7440211	ESCAMBIA OPERATING COMPANY LLC	SO_2
FL	12123-752411	FOLEY CELLULOSE PERRY MILL	SO_2, NO_X
FL	12086-900111	CEMEX MIAMI CEMENT PLANT	NO_X
FL	12017-640611	DUKE CRYSTAL RIVER	NO_X, SO_2
FL	12086-900011	FPL TURKEY POINT	NO_X
FL	12033-752711	GULF CLEAN ENERGY CENTER (CRIST)	SO_2
FL	12086-3532711	HOMESTEAD CITY UTILITIES	NO_X
FL	12031-640211	JEA NORTHSIDE	SO_2
FL	12105-717711	MOSAIC NEW WALES	SO_2
FL	12057-716411	MOSAIC RIVERVIEW	SO_2
FL	12105-919811	MOSAIC BARTOW	SO_2
FL	12089-845811	RAYONIER PERFORMANCE FIBERS LLC	SO_2, NO_X
FL	12089-753711	WESTROCK FERNANDINA BEACH MILL	SO_2, NO_X
FL	12005-535411	WESTROCK PANAMA CITY MILL	SO_2
FL	12129-2731711	TALLAHASSEE CITY PURDOM GENERATING STA.	NO_X
FL	12057-538611	TECO BIG BEND	SO_2
FL	12086-899911	TITAN-PENNSUCO	NO_X
FL	12047-769711	NUTRIEN WHITE SPRINGS AGRICULTURAL CHEMICALS, INC	SO_2

In addition, other VISTAS states identified sources for PSAT tagging. The detailed PSAT process for each VISTAS state is provided in their individual regional haze SIPs.

Based on the sources identified by Florida and the other VISTAS states, VISTAS included 87 facilities for SO_2 and NO_X PSAT tagging. Some of the 87 facilities were identified by multiple states. Table 7-12 lists PSAT tags for facilities in AL and FL. Table 7-13 lists PSAT tags for facilities in GA, KY, MS, NC, SC, and TN. Table 7-14 lists PSAT tags for facilities in VA and

[53] Please note that the AoI screening threshold and resulting PSAT analysis were not the exclusive method for selecting sources for reasonable progress analysis. Section 7.6.4 discusses additional considerations in source selection to evaluate other significant sources that were not identified by the AoI screening threshold.

WV. Table 7-15 lists PSAT tags for facilities in AR, MO, PA, IL, IN, and OH. The contributions from all 87 PSAT tags were evaluated at all Class I areas in the VISTAS_12 domain.

A detailed description of the PSAT modeling and post-processing for creating PSAT contributions for Class I areas is contained in Appendix E-7a and Appendix E-7b.

Table 7-12: PSAT Tags Selected for Facilities in AL and FL

State	RPO	Facility ID	Facility Name	SO_2 (TPY)	NOx (TPY)
AL	VISTAS	01097-949811	AKZO NOBEL CHEMICALS INC	3,335.72	20.71
AL	VISTAS	01097-1056111	ALA POWER - BARRY	6,033.17	2,275.76
AL	VISTAS	01129-1028711	AMERICAN MIDSTREAM CHATOM, LLC	3,106.38	425.87
AL	VISTAS	01073-1018711	DRUMMOND COMPANY, INC.	2,562.17	1,228.55
AL	VISTAS	01053-7440211	ESCAMBIA OPERATING COMPANY LLC	18,974.39	349.32
AL	VISTAS	01053-985111	ESCAMBIA OPERATING COMPANY LLC	8,589.60	149.64
AL	VISTAS	01103-1000011	NUCOR STEEL DECATUR LLC	170.23	331.24
AL	VISTAS	01109-985711	SANDERS LEAD CO	7,951.06	121.71
AL	VISTAS	01097-1061611	UNION OIL OF CALIFORNIA - CHUNCHULA GAS PLANT	2,573.15	349.23
FL	VISTAS	12123-752411	FOLEY CELLULOSE PERRY MILL	1,520.42	1,830.71
FL	VISTAS	12086-900111	CEMEX MIAMI CEMENT PLANT	29.51	910.36
FL	VISTAS	12017-640611	DUKE CRYSTAL RIVER	5,306.41	2,489.85
FL	VISTAS	12086-900011	FPL TURKEY POINT	13.05	170.61
FL	VISTAS	12033-752711	GULF –CLEAN ENERGY CENTER (CRIST)	2,615.65	2,998.39
FL	VISTAS	12086-3532711	HOMESTEAD CITY UTILITIES	0.00	97.09
FL	VISTAS	12031-640211	JEA NORTHSIDE	2,094.48	651.79
FL	VISTAS	12105-717711	MOSAIC NEW WALES	7,900.67	310.42
FL	VISTAS	12057-716411	MOSAIC RIVERVIEW	3,034.06	159.71
FL	VISTAS	12105-919811	MOSAIC BARTOW	4,425.56	141.02
FL	VISTAS	12089-845811	RAYONIER PERFORMANCE FIBERS LLC	561.97	2,327.10
FL	VISTAS	12089-753711	WEESTROCK FERNANDINA BEACH MILL	2,606.72	2,316.77
FL	VISTAS	12005-535411	WESTROCK PANAMA CITY MILL	2,590.88	1,404.89
FL	VISTAS	12129-2731711	TALLAHASSEE CITY PURDOM GENERATING STA.	2.86	121.46
FL	VISTAS	12057-538611	TECO BIG BEND	6,084.90	2,665.03
FL	VISTAS	12086-899911	TITAN-PENNSUCO	9.38	879.70
FL	VISTAS	12047-769711	NUTRIEN WHITE SPRINGS AGRICULTURAL CHEMICALS, INC	3,197.77	112.41

Table 7-13: PSAT Tags Selected for Facilities in GA, KY, MS, NC, SC, and TN

State	RPO	Facility ID	Facility Name	SO_2 (TPY)	NOx (TPY)
GA	VISTAS	13127-3721011	BRUNSWICK CELLULOSE INC	294.20	1,554.51
GA	VISTAS	13015-2813011	GA POWER COMPANY - PLANT BOWEN	10,453.41	6,643.32
GA	VISTAS	13103-536311	GEORGIA-PACIFIC CONSUMER PRODUCTS LP (SAVANNAH RIVER MILL)	1,860.18	351.52
GA	VISTAS	13051-3679811	INTERNATIONAL PAPER – SAVANNAH	3,945.38	1,560.73
GA	VISTAS	13115-539311	TEMPLE INLAND	1,791.00	1,773.35
KY	VISTAS	21183-5561611	BIG RIVERS ELECTRIC CORP - WILSON STATION	6,934.16	1,151.95
KY	VISTAS	21091-7352411	CENTURY ALUMINUM OF KY LLC	5,044.16	197.66
KY	VISTAS	21177-5196711	TENNESSEE VALLEY AUTHORITY - PARADISE FOSSIL PLANT	3,011.01	3,114.52
KY	VISTAS	21145-6037011	TENNESSEE VALLEY AUTHORITY (TVA) - SHAWNEE FOSSIL PLANT	19,504.75	7,007.34
MS	VISTAS	28059-8384311	CHEVRON PRODUCTS COMPANY, PASCAGOULA REFINERY	741.60	1,534.12
MS	VISTAS	28059-6251011	MISSISSIPPI POWER COMPANY, PLANT VICTOR J DANIEL	231.92	3,829.72
NC	VISTAS	37087-7920511	BLUE RIDGE PAPER PRODUCTS - CANTON MILL	1,127.07	2,992.37
NC	VISTAS	37117-8049311	DOMTAR PAPER COMPANY, LLC	687.45	1,796.49
NC	VISTAS	37035-8370411	DUKE ENERGY CAROLINAS, LLC - MARSHALL STEAM STATION	4,139.21	7,511.31
NC	VISTAS	37013-8479311	PCS PHOSPHATE COMPANY, INC. - AURORA	4,845.90	495.58
NC	VISTAS	37023-8513011	SGL CARBON LLC	261.64	21.69
SC	VISTAS	45015-4834911	ALUMAX OF SOUTH CAROLINA	3,751.69	108.08
SC	VISTAS	45043-5698611	INTERNATIONAL PAPER GEORGETOWN MILL	2,767.52	2,031.26
SC	VISTAS	45019-4973611	KAPSTONE CHARLESTON KRAFT LLC	1,863.65	2,355.82
SC	VISTAS	45015-4120411	SANTEE COOPER CROSS GENERATING STATION	4,281.17	3,273.47
SC	VISTAS	45043-6652811	SANTEE COOPER WINYAH GENERATING STATION	2,246.86	1,772.53
SC	VISTAS	45015-8306711	SCE&G WILLIAMS	392.48	992.73
TN	VISTAS	47093-4979911	CEMEX - KNOXVILLE PLANT	121.47	711.50
TN	VISTAS	47163-3982311	EASTMAN CHEMICAL COMPANY	6,420.16	6,900.33
TN	VISTAS	47105-4129211	TATE & LYLE, LOUDON	472.76	883.25
TN	VISTAS	47001-6196011	TVA BULL RUN FOSSIL PLANT	622.54	964.16
TN	VISTAS	47161-4979311	TVA CUMBERLAND FOSSIL PLANT	8,427.33	4,916.52
TN	VISTAS	47145-4979111	TVA KINGSTON FOSSIL PLANT	1,886.09	1,687.38

Table 7-14: PSAT Tags Selected for Facilities in VA and WV

State	RPO	Facility ID	Facility Name	SO_2 (TPY)	NOx (TPY)
VA	VISTAS	51027-4034811	JEWELL COKE COMPANY LLP	5,090.95	520.17
VA	VISTAS	51580-5798711	MEADWESTVACO PACKAGING RESOURCE GROUP	2,115.31	1,985.69
VA	VISTAS	51023-5039811	ROANOKE CEMENT COMPANY	2,290.17	1,972.97
WV	VISTAS	54033-6271711	ALLEGHENY ENERGY SUPPLY CO, LLC-HARRISON	10,082.94	11,830.88
WV	VISTAS	54049-4864511	AMERICAN BITUMINOUS POWER-GRANT TOWN PLT	2,210.25	1,245.10
WV	VISTAS	54079-6789111	APPALACHIAN POWER COMPANY - JOHN E AMOS PLANT	10,984.24	4,878.10
WV	VISTAS	54023-6257011	DOMINION RESOURCES, INC. - MOUNT STORM POWER STATION	2,123.64	1,984.14
WV	VISTAS	54041-6900311	EQUITRANS - COPLEY RUN CS 70	0.10	511.06
WV	VISTAS	54083-6790711	FILES CREEK 6C4340	0.15	643.35
WV	VISTAS	54083-6790511	GLADY 6C4350	0.11	343.29
WV	VISTAS	54093-6327811	KINGSFORD MANUFACTURING COMPANY	16.96	140.88
WV	VISTAS	54061-16320111	LONGVIEW POWER	2,313.73	1,556.57
WV	VISTAS	54051-6902311	MITCHELL PLANT	5,372.40	2,719.62
WV	VISTAS	54061-6773611	MONONGAHELA POWER CO.- FORT MARTIN POWER	4,881.87	13,743.32
WV	VISTAS	54073-4782811	MONONGAHELA POWER CO-PLEASANTS POWER STA	16,817.43	5,497.37
WV	VISTAS	54061-6773811	MORGANTOWN ENERGY ASSOCIATES	828.64	655.58

Table 7-15: PSAT Tags Selected for Facilities in AR, MO, PA, IL, IN, and OH

State	RPO	Facility ID	Facility Name	SO_2 (TPY)	NOx (TPY)
AR	CENSARA	05063-1083411	ENTERGY ARKANSAS INC-INDEPENDENCE PLANT	32,050.48	14,133.10
MO	CENSARA	29143-5363811	NEW MADRID POWER PLANT-MARSTON	16,783.71	4,394.10
MD	MANE-VU	24001-7763811	LUKE PAPER COMPANY	22,659.84	3,607.00
PA	MANE-VU	42005-3866111	GENON NE MGMT CO/KEYSTONE STA	56,939.25	6,578.47
PA	MANE-VU	42063-3005211	HOMER CITY GEN LP/ CENTER TWP	11,865.70	5,215.96
PA	MANE-VU	42063-3005111	NRG WHOLESALE GEN/SEWARD GEN STA	8,880.26	2,254.64
IL	LADCO	17127-7808911	JOPPA STEAM	20,509.28	4,706.35
IN	LADCO	18173-8183111	ALCOA WARRICK POWER PLT AGC DIV OF AL	5,071.28	11,158.55
IN	LADCO	18051-7363111	GIBSON	23,117.23	12,280.34
IN	LADCO	18147-8017211	INDIANA MICHIGAN POWER DBA AEP ROCKPORT	30,536.33	8,806.77
IN	LADCO	18125-7362411	INDIANAPOLIS POWER & LIGHT PETERSBURG	18,141.88	10,665.27
IN	LADCO	18129-8166111	SIGECO AB BROWN SOUTH INDIANA GAS & ELE	7,644.70	1,578.59
OH	LADCO	39081-8115711	CARDINAL POWER PLANT (CARDINAL OPERATING COMPANY) (0641050002)	7,460.79	2,467.31
OH	LADCO	39031-8010811	CONESVILLE POWER PLANT (0616000000)	6,356.23	9,957.87
OH	LADCO	39025-8294311	DUKE ENERGY OHIO, WM. H. ZIMMER STATION (1413090154)	22,133.90	7,149.97
OH	LADCO	39053-8148511	GENERAL JAMES M. GAVIN POWER PLANT (0627010056)	41,595.81	8,122.51
OH	LADCO	39053-7983011	OHIO VALLEY ELECTRIC CORP., KYGER CREEK STATION (0627000003)	3,400.14	9,143.84

7.6.2. PSAT Contributions at Florida Class I Areas

The original PSAT results were determined based on the initial 2028 SO_2 and NO_X point emissions, which may be found in Appendix B-1a and Appendix B-1b. As described in Section 4.1.8 and Section 7.2.4, the 2028 EGU and non-EGU point emissions were updated for a new 2028 model run (Task 2B and Task 3B reports), but the original PSAT runs were not redone. Details of the updated emissions may be found in Appendix B-2a and Appendix B-2b. Instead, the original PSAT results were linearly scaled to reflect the updated 2028 emissions. The details of the PSAT adjustments can be found in Appendix E-7b.

The adjusted PSAT results were used to calculate the percent contribution of each tagged facility to the total sulfate and nitrate point source (EGU + non-EGU) contribution at each Class I area. Then, the facilities were sorted from highest impact to lowest impact.

Table 7-16 contains PSAT results for Chassahowitzka. Five facilities where sulfate contributions are above 1.00% are included in the table and address more than 12.0% of the entire sulfate plus nitrate point source visibility impact in 2028. Table 7-17 contains PSAT results for St. Marks. Three facilities where sulfate contributions are above 1.00% are included in the table and address more than 10% of the entire sulfate plus nitrate point source visibility impact in 2028. Table 7-18 contains PSAT results for Everglades. Four facilities where sulfate contributions are above 1.00% are included in the table and address almost 9% of the entire sulfate plus nitrate point source visibility impact in 2028.

Table 7-19 and Table 7-20 contain the PSAT results for Florida facilities significantly impacting (sulfate contributions of at least 1.00%) Okefenokee and Wolf Island in Georgia, respectively.

The full list of tagged facilities and their contributions to each Class I area can be found in Appendix E-7b.

Table 7-16: PSAT Results for Chassahowitzka

State	Facility ID	Facility Name	Distance (km)	Final Revised Sulfate PSAT (Mm^{-1})	Final Revised EGU+NEG (Mm^{-1})	Final Revised Sulfate PSAT, %	Final Revised Nitrate PSAT (Mm^{-1})	Final Revised EGU+NEG (Mm^{-1})	Final Revised Nitrate PSAT, %
FL	12017-640611	010: Duke Crystal River	27.4	0.629	9.760	6.45%	0.023	9.760	0.23%
GA	13015-2813011	021: Ga Power Company - Plant Bowen	637.2	0.230	9.760	2.36%	0.003	9.760	0.03%
FL	12057-538611	014: TECO Big Bend	106.8	0.129	9.760	1.32%	0.007	9.760	0.07%
KY	21145-6037011	025: Tennessee Valley Authority (TVA) - Shawnee Fossil Plant	1,098.0	0.102	9.760	1.05%	0.005	9.760	0.05%
AL	01109-985711	008: Sanders Lead Co	471.2	0.101	9.760	1.03%	0.001	9.760	0.01%

Table 7-17: PSAT Results for St. Marks

State	Facility ID	Facility Name	Distance (km)	Final Revised Sulfate PSAT (Mm^{-1})	Final Revised EGU+NEG (Mm^{-1})	Final Revised Sulfate PSAT, %	Final Revised Nitrate PSAT (Mm^{-1})	Final Revised EGU+NEG (Mm^{-1})	Final Revised Nitrate PSAT, %
GA	13015-2813011	021: Ga Power Company - Plant Bowen	452.9	0.574	11.390	5.04%	0.004	11.390	0.04%
FL	12005-535411	009: WestRock Panama City Mill	140.8	0.540	11.390	4.74%	0.015	11.390	0.13%
AL	01109-985711	008: Sanders Lead Co	255.9	0.131	11.390	1.15%	0.000	11.390	0.00%

Table 7-18: PSAT Results for Everglades

State	Facility ID	Facility Name	Distance (km)	Final Revised Sulfate PSAT (Mm^{-1})	Final Revised EGU+NEG (Mm^{-1})	Final Revised Sulfate PSAT, %	Final Revised Nitrate PSAT (Mm^{-1})	Final Revised EGU+NEG (Mm^{-1})	Final Revised Nitrate PSAT, %
FL	12057-538611	014: TECO Big Bend	316.6	0.044	1.303	3.38%	0.000	1.303	0.00%
FL	12086-899911	079: Titan-Pennsuco	61.7	0.003	1.303	0.23%	0.035	1.303	2.69%
FL	12105-919811	019: Mosaic Bartow	304.7	0.035	1.303	2.68%	0.000	1.303	0.00%
FL	12105-717711	018: Mosaic New Wales	303.3	0.035	1.303	2.66%	0.000	1.303	0.00%

Table 7-19: PSAT Results for Florida Facilities Significantly Impacting Okefenokee (GA)

State	Facility ID	Facility Name	Distance (km)	Final Revised Sulfate PSAT (Mm^{-1})	Final Revised EGU+NEG (Mm^{-1})	Final Revised Sulfate PSAT, %	Final Revised Nitrate PSAT (Mm^{-1})	Final Revised EGU+NEG (Mm^{-1})	Final Revised Nitrate PSAT, %
FL	12047-769711	013: Nutrien White Springs Agricultural Chemicals, Inc	71.5	0.372	12.955	2.87%	0.002	12.955	0.01%
FL	12123-752411	020: Foley Cellulose Perry Mill	153.5	0.289	12.955	2.23%	0.019	12.955	0.15%
FL	12089-753711	016: WestRock Fernandina Beach Mill	64.8	0.176	12.955	1.36%	0.020	12.955	0.15%

Table 7-20: PSAT Results for Florida Facilities Significantly Impacting Wolf Island (GA)

State	Facility ID	Facility Name	Distance (km)	Final Revised Sulfate PSAT (Mm^{-1})	Final Revised EGU+NEG (Mm^{-1})	Final Revised Sulfate PSAT, %	Final Revised Nitrate PSAT (Mm^{-1})	Final Revised EGU+NEG (Mm^{-1})	Final Revised Nitrate PSAT, %
FL	12089-753711	016: WestRock Fernandina Beach Mill	74.9	0.304	12.508	2.43%	0.018	12.508	0.14%
FL	12031-640211	011: JEA Northside	105.1	0.167	12.508	1.34%	0.008	12.508	0.06%

7.6.3. AoI versus PSAT Contributions

After the PSAT modeling was completed, a comparison was made of PSAT results to AoI results. The PSAT results used in this comparison did not incorporate any PSAT adjustments discussed in Appendix E-7b to better match the emissions used in the AoI analysis. Only PSAT contributions greater than or equal to 1.00% were included in the analysis. Figure 7-54 shows the ratio of AoI/PSAT contributions for sulfate as a function of distance from the facility to the Class I area. Figure 7-55 shows the fractional bias for sulfate as a function of distance from the facility to the Class I area. Fraction bias (FB) is equal to 2*(AoI – PSAT)/(AoI + PSAT). Fractional bias gives equal weight to over predictions and under predictions. If FB equals 100%, then the AoI contribution is three times higher than the PSAT contribution.

Based on Figure 7-54 and Figure 7-55, AoI tends to overestimate impacts for facilities near the Class I area. In fact, if the facility is less than 100 km from the Class I area, the AoI results are almost always at least three times higher than the PSAT results. As a result, some sources near a Class I area were tagged for PSAT but were found to not have a significant contribution to visibility impairment. PSAT is the most reliable modeling tool for tracking facility contributions to visibility impairment at Class I areas. Therefore, AoI impacts for nearby sources can be adjusted downward to remove the systematic bias in the contributions. Also, AoI tends to underestimate impacts for facilities far away from the Class I area. Although AoI may underestimate the impact of some far away sources, the visibility impairment of those sources were likely included in the PSAT analysis and found to be significantly contributing to visibility impairment in the Class I area because they were tagged for PSAT analysis by states with Class I areas that are closer to those sources.

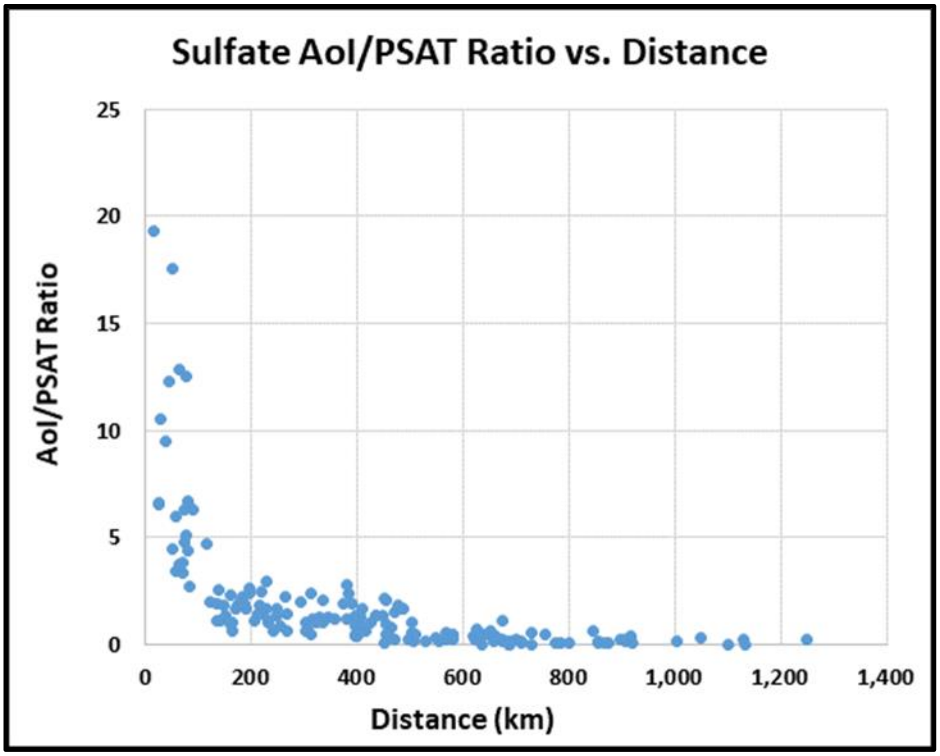


Figure 7-54: Ratio of AoI/PSAT % Contributions for Sulfate as a Function of Distance from the Facility to the Class I Area

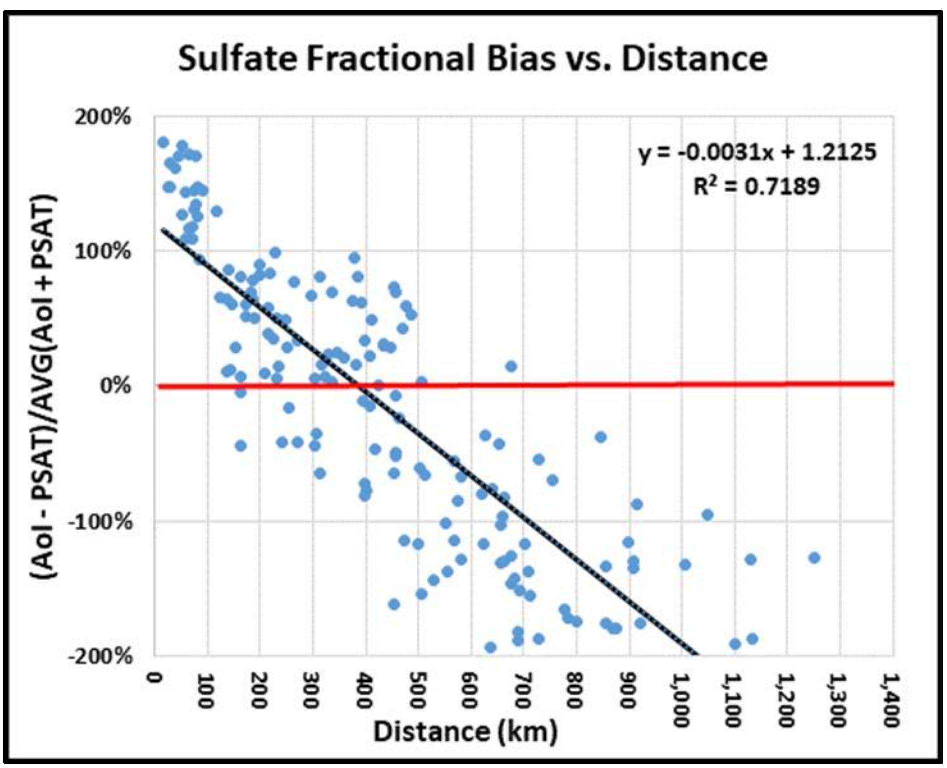


Figure 7-55: Fractional Bias for Sulfate as a Function of Distance from the Facility to the Class I Area

Although many facilities were tagged with PSAT, there are some facilities identified by AoI with a sulfate + nitrate contribution over 1% that were not tagged.

Table 7-21 shows AoI NO_X and SO_2 facility contributions to visibility impairment on the 20% most impaired days at Chassahowitzka (individual facility nitrate or sulfate contribution divided by total nitrate plus sulfate contributions from EGU and non-EGU point sources). There are two facilities in the table that were not tagged with PSAT. Table 7-22 shows AoI NO_X and SO_2 facility contributions to visibility impairment on the 20% most impaired days at St. Marks. There are three facilities in the table that were not tagged with PSAT. Table 7-23 shows AoI NO_X and SO_2 facility contributions to visibility impairment on the 20% most impaired days at Everglades. There are twelve facilities in the table that were not tagged with PSAT.

Table 7-21: AoI NO_X and SO_2 Facility Contributions to Visibility Impairment on the 20% Most Impaired Days at Chassahowitzka

State	Facility ID	Facility Name	Distance (km)	2028 NO_X (tpy)	2028 SO_2 (tpy)	Nitrate (%)	Sulfate (%)	Sulfate + Nitrate (%)
FL	12017-640611	DUKE CRYSTAL RIVER	27.4	2,489.8	5,306.4	1.95%	63.62%	65.57%
FL	12053-716011	CENTRAL POWER AND LIME	21.5	631.6	235.0	1.05%	4.31%	5.36%
FL	12057-538611	TECO BIG BEND	106.8	2,665.0	6,084.9	0.24%	4.73%	4.96%
FL	12105-643111	LAKELAND C.D. MCINTOSH POWER PLANT(1)	96.1	1,765.3	4,202.2	0.12%	3.12%	3.24%
FL	12105-717711	MOSAIC NEW WALES	112.6	310.4	3,581.0	0.02%	2.09%	2.11%
FL	12057-716411	MOSAIC RIVERVIEW	99.7	159.7	1,890.0	0.02%	2.01%	2.03%
FL	12105-919811	MOSAIC BARTOW	112.2	141.0	3,614.0	0.01%	1.90%	1.91%
FL	12095-845411	OUC STANTON(1)	138.8	4,033.4	2,690.6	0.19%	1.19%	1.37%

(1) These facilities were not tagged in the PSAT analysis.

Table 7-22: AoI NO_X and SO_2 Facility Contributions to Visibility Impairment on the 20% Most Impaired Days at St. Marks

State	Facility ID	Facility Name	Distance (km)	2028 NO_X (tpy)	2028 SO_2 (tpy)	Nitrate (%)	Sulfate (%)	Sulfate + Nitrate (%)
FL	12005-535411	WESTROCK PANAMA CITY MILL	140.8	1,404.9	2,590.9	0.24%	8.54%	8.78%
FL	12123-752411	FOLEY CELLULOSE PERRY MILL	61.4	1,830.7	1,520.4	0.51%	6.65%	7.16%
AL	01053-7440211	ESCAMBIA OPERATING COMPANY LLC	325.6	349.3	7,963.0	0.01%	5.95%	5.96%
FL	12017-640611	DUKE CRYSTAL RIVER	189.3	2,489.8	5,306.4	0.24%	5.45%	5.69%
FL	12047-769711	NUTRIEN WHITE SPRINGS AGRICULTURAL CHEMICALS, INC	137.7	112.4	2,745.0	0.01%	4.34%	4.35%
AL	01109-985711	SANDERS LEAD CO	255.9	121.7	7,951.1	0.00%	3.06%	3.06%
FL	12057-538611	TECO BIG BEND	307.1	2,665.0	6,084.9	0.07%	1.90%	1.97%
AL	01097-1056111	ALA POWER - BARRY	383.1	2,181.9	6,025.6	0.03%	1.67%	1.71%
FL	12033-752711	GULF CLEAN ENERGY CENTER (CRIST)	299.5	2,998.4	2,615.7	0.08%	1.49%	1.57%
FL	12129-2731711	TALLAHASSEE PURDOM GENERATING STA.	8.7	121.5	2.9	1.00%	0.52%	1.52%
GA	13099-931711	GEORGIA-PACIFIC CORP CEDAR SPRINGS OPERATION(1)	149.2	2,884.2	510.1	0.29%	0.88%	1.17%
AL	01097-1061611	UNION OIL OF CALIFORNIA - CHUNCHULA GAS PLANT	396.3	349.2	2,573.2	0.01%	1.15%	1.15%
LA	22101-8020311	COLUMBIAN CHEMICALS CO - NORTH BEND PLANT(1)	705.9	640.3	7,834.0	0.00%	1.11%	1.12%
FL	12031-640211	JEA NORTHSIDE	253.7	651.8	2,094.5	0.03%	1.07%	1.10%
MO	29071-6032111	AMEREN MISSOURI-LABADIE PLANT(1)	1,121.8	9,685.5	41,740.3	0.01%	1.02%	1.02%

(1) These facilities were not tagged in the PSAT analysis.

Table 7-23: AoI NO_X and SO_2 Facility Contributions to Visibility Impairment on the 20% Most Impaired Days at Everglades

State	Facility ID	Facility Name	Distance (km)	2028 NO_X (tpy)	2028 SO_2 (tpy)	Nitrate	Sulfate (%)	Sulfate + Nitrate (%)
FL	12086-9806211	MIAMI INTL[1]	58.62	4,371.9	424.9	14.07%	8.74%	22.81%
FL	12011-9791511	FORT LAUDERDALE/HOLLYWOOD[1]	92.1	1,922.6	207.7	2.53%	2.02%	4.55%
FL	12086-641611	MIAMI-DADE WATER AND SEWER DEPARTMENT[2]	38.1	50.5	61.1	0.44%	3.96%	4.39%
FL	12086-900011	FPL TURKEY POINT	35.4	170.6	13.0	2.49%	1.57%	4.06%
FL	12086-900111	CEMEX MIAMI CEMENT PLANT	50.8	910.4	29.5	2.93%	0.73%	3.65%
FL	12057-538611	TECO BIG BEND	316.6	2,665.0	6,084.9	0.08%	3.02%	3.10%
FL	12105-643111	LAKELAND C.D. MCINTOSH, JR. POWER PLANT[1]	322.8	1,765.3	4,202.2	0.17%	2.84%	3.01%
FL	12086-3532711	HOMESTEAD CITY UTILITIES	22.7	97.1	0.0	2.48%	0.00%	2.48%
FL	12105-717711	MOSAIC NEW WALES	303.3	310.4	3,581.0	0.02%	2.26%	2.28%
FL	12105-919811	MOSAIC BARTOW	304.7	141.0	3,614.0	0.01%	2.21%	2.22%
FL	12086-641511	MIAMI-DADE WATER AND SEWER DEPARTMENT[1]	66.1	51.2	131.8	0.12%	2.09%	2.21%
FL	12086-899911	TITAN-PENNSUCO	61.7	879.7	9.4	2.02%	0.16%	2.18%
FL	12071-8515111	WASTE MANAGEMENT INC. OF FLORIDA[1]	173.2	5.8	390.4	0.00%	1.98%	1.98%
FL	12095-845411	OUC STANTON[1]	346.1	4,033.4	2,690.6	0.25%	1.41%	1.66%
FL	12086-640011	MIAMI-DADE WATER AND SEWER DEPARTMENT[1]	49.3	251.4	0.2	1.22%	0.01%	1.23%
TX	48401-Full_6146	MARTIN LAKE[1]	1,552.8	12,358.3	56,110.3	0.01%	1.17%	1.18%
FL	12105-535711	MOSAIC SOUTH PIERCE[1]	293.1	29.5	1,123.5	0.00%	1.17%	1.18%
FL	12011-3947211	WASTE MANAGEMENT INC. OF FLORIDA[1]	112.0	64.5	175.3	0.06%	0.97%	1.03%
FL	12011-591711	FLORIDA POWER & LIGHT (PFL) [1]	90.0	759.9	0.0	1.03%	0.00%	1.03%

[1] These facilities were not tagged in the PSAT analysis.

[2] Although this facility met the individual AoI contribution of ≥5% for sulfates (individual facility sulfate contribution divided by total sulfate contribution from all EGU and non-EGU point sources), the facility was not selected because the projected 2028 emissions were based on 2011 emissions, when the facility was using higher sulfur content fuel. Recent actual emissions are significantly lower (2018 and 2019 SO_2 emissions are 9 and 4 tpy, respectively) and low emissions are expected to continue due to use of lower sulfur content fuel. Additionally, as described in this section, the AoI likely overpredicted the impact of small facilities located very near Class I areas, such as this one.

7.6.4. Selection of Sources for Reasonable Progress Evaluation

EPA has made clear that each state has the authority to select the sources to evaluate for reasonable progress analysis and to determine the factors used in making such selection as long as the factors used in the process are explained and justified in the state's plan. Subsection 169A(b) requires EPA to "provide guidelines to the **States**" [emphasis added] and "require **each applicable implementation plan for a State**" [emphasis added] to address reasonable progress including the requirement for long-term strategies. In promulgating its Regional Haze Rules, EPA stated that "**The State must include in its implementation plan a description of the criteria it used to determine which sources or groups of sources** it evaluated and how the four-factors were taken into consideration in selecting the measures for inclusion in its long-term strategy." [emphasis added.] EPA's August 20, 2019 guidance on Regional Haze SIPs for the second implementation period goes on to clearly state that the selection of emission sources for analysis is the responsibility of the state. The EPA guidance states the following:

> The Regional Haze Rule does not explicitly list factors that a state must or may not consider when selecting the sources for which it will determine what control measures are necessary to make reasonable progress. A state opting to select a set of its sources to analyze must reasonably choose factors and apply them in a reasonable way given the statutory requirement to make reasonable progress towards natural visibility. Factors could include, but are not limited to, baseline source emissions, baseline source visibility impacts (or a surrogate metric for the impacts), the in-place emission control measures and by implication the emission reductions that are possible to achieve at the source through additional measures, the four statutory factors (to the extent they have been characterized at this point in SIP development), potential visibility benefits (also to the extent they have been characterized at this point in SIP development), and the five additional required factors listed in 40 CFR 51.308(f)(2)(iv).[54]

The EPA guidance goes on to discuss which pollutants to consider. The guidance discusses methods for estimating baseline visibility impacts for selected sources, including residence time analysis and photochemical modeling, both of which were used by Florida and other VISTAS states. The selection of pollutants to consider and the residence time analysis are discussed in Section 7.4 and Section 7.5 of this SIP. The use of photochemical modeling to better understand source contribution to modeled visibility and further refine the sources selected is discussed in Section 7.6.

[54] EPA, "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period", page 10. August 20, 2019.

The EPA guidance also discussed using estimates of visibility impacts to select sources including the use of a visibility impact threshold level for selecting sources. Florida, as well as the other VISTAS states, have used a two-step process for selecting sources. The first step was a screening analysis using the NO_X and SO_2 source category and facility contributions from the AoI analysis described in Section 7.5. The second step was CAMx PSAT modeling of the sources selected in step 1. Sources were then selected for reasonable progress analysis. This two-step process was used to select sources that have the largest contribution to visibility impairment, and thus, greatest opportunity for reasonable progress improvement, at Class I areas. This process also resulted in selecting a number of sources that Florida, and states that contribute to Florida Class I areas, could analyze with the limited resources available to the state. Sources selected for analysis by Florida include sources that contribute to visibility impairment in both Florida and non-Florida Class I areas. Thresholds selected by Florida for each of the steps are discussed in this document. As explained in Section 7.6.3, PSAT modeling resulted in significantly different results than the AoI analysis. Therefore, it is appropriate to have different percentage thresholds for these two steps in the selection process. EPA's guidance states, "Whatever threshold is used, the state must justify why the use of that threshold is a reasonable approach…" The justification for the thresholds used in both steps of the selection process are described in this plan.

In the regional haze SIPs developed for the first round of planning, many VISTAS states used the AoI approach and a 1% threshold by unit. Florida followed a different approach using Q/d, but showed that this approach screened in a similar number of units to the AoI approach and therefore had similar screening stringency. In this second round of planning for regional haze SIPs, all VISTAS states, including Florida, are using the AoI/PSAT approach and a ≥ 1.00% PSAT threshold by facility for screening sources for reasonable progress evaluation. Using a facility basis for emission estimates will pull in more facilities as compared to a unit basis for emission estimates. In the regional haze SIPs developed in the first round of planning, 2018 emissions were used as the starting point and 2018 Class I visibility impacts were used in the denominator of the percent contribution calculations. In this second round of planning for regional haze, VISTAS states are using 2028 point EGU and non-EGU SO_2 and NO_X emissions as the starting point and 2028 point EGU and non-EGU Class I visibility impacts in the denominator of the percent contribution calculations, which are generally lower than the emissions and visibility impacts from point sources in 2018. As a result, more facilities with smaller visibility impacts (in Mm^{-1}) were examined as compared to the first round of regional haze planning. In addition, point sources contribute a much smaller absolute amount of visibility impairment in Mm-1 at Everglades compared to point sources contributing to other Class I areas. This makes the 1.00% screening threshold even more stringent for Everglades. Overall, the VISTAS screening approach results in a reasonable number of sources that can be evaluated with limited state resources and focuses on the sources and pollutants with the largest impacts. In addition, the PSAT analysis was not the exclusive method for selecting sources. As discussed further below, Florida also evaluated other significant sources that were not identified by the PSAT screening threshold to ensure that a reasonable set of sources was selected for analysis.

Based on the PSAT results presented in Table 7-16 through Table 7-20, all facilities with a ≥ 1.00% PSAT threshold for sulfate or nitrate were selected for reasonable progress, except for one facility for Everglades (Titan-Pennsuco, >1.00% for nitrates) and Sanders Lead Co. in Alabama. Firstly, regarding Titan-Pennsuco, Florida is choosing to focus on SO_2 emissions and sulfate impacts for this round because, as discussed previously, sulfates still contribute the majority of anthropogenic light extinction at all Class I areas, including Everglades. Additionally, the stack parameters used for Titan-Pennsuco in the source apportionment modeling were incorrect. These incorrect modeled stack parameters led to an overestimation of the facility's modeled visibility impairment. As shown in Table 7-24 below, Titan Pennsuco's actual exit gas temperature is slightly lower than what was modeled, but the actual exit gas velocity is higher, and the actual stack height and diameter are significantly higher than what was modeled; therefore, the model likely underestimated plume rise and overestimated visibility impacts. In addition, a similar cement plant (CEMEX) located 11 km closer to Everglades was modeled below 1.00% for nitrates.

Table 7-24. Titan-Pennsuco modeled stack parameters vs. actual stack parameters and CEMEX modeled stack parameters

Parameters	Stack Height (FT)	Stack Diameter (FT)	Exit Gas Velocity (FPS)	Exit Gas Temp (°F)	NO_X Emissions	Final Adjusted PSAT % impact (nitrates)
Modeled:	150	3	55.8	235	2,376 tpy	2.69
Actual:	369	14	63.9	218	2,376 tpy	N/A
CEMEX Modeled:	359	8	160.9	464	2,600 tpy	0.88

For Sanders Lead Co., Alabama provided additional information in a letter showing that this facility's recent SO_2 emissions have significantly reduced from the initial 2028 projections of 7,961.1 tpy. A scrubber went online in late 2019 and reduced the worst-case potential emissions to about 1,400 tpy of SO_2. Scaling their PSAT sulfate contribution of 1.03% at Chassahowitzka and 1.15% at St. Marks by the ratio of recent to 2028 emissions (1,400/7,961.1) which results in a revised PSAT sulfate contribution of 0.18% at Chassahowitzka and 0.20% at St. Marks, well below the 1.00% threshold. The letter from Alabama Department of Environmental Management confirming the lowered SO_2 emission rates can be found in Appendix F-1c.

Overall, the facilities selected for reasonable progress based on the PSAT analysis are four facilities for Chassahowitzka, two facilities for St. Marks, and three facilities for Everglades.

There were also three Florida facilities selected for the Georgia Class I area Okefenokee and two Florida facilities selected for Georgia Class I area Wolf Island.

The Department also identified some additional large sources of SO_2 in Florida that were not selected through the AoI/PSAT screening process. Georgia also identified some additional large sources of SO_2 in Florida that had the potential to contribute to visibility impairment at Georgia Class I areas that had not been selected through AoI/PSAT screening. The Department looked at these additional sources to determine whether any should be selected for reasonable progress analysis, as discussed below.

- **IFF CHEMICAL HOLDINGS, INC. (12031-770211)** – This facility is 56.8 km from Okefenokee Wilderness Area and the AoI sulfate contribution is 3.25%. Also, this facility is 118.5 km from Wolf Island Wilderness and the AoI sulfate contribution is 1.22%. SO_2 emissions used in the AoI analysis was 898.9 tpy. The highest SO_2 emissions in the last three years was 634.37 tpy in 2018. Whereas the projected 2028 emissions were tied to the 2011 base year, more recent emissions from the facility better reflect how the facility has operated recently and how it is expected to operate in the future. From 2016 to 2020, turpentine throughput at the facility decreased 27% compared to the prior 10 years and percent total sulfur in crude sulfate turpentine processed by the facility (the main source of SO_2 emissions) has decreased 16% compared to the prior 10 years. This level of activity is expected to continue through the foreseeable future. Scaling the AoI sulfate contribution of 3.25% and 1.22% by the ratio of 2018 to 2028 SO_2 emissions (634.37/898.9) results in a revised AoI sulfate contribution of 2.29% for Okefenokee Wilderness Area and 0.86% for Wolf Island Wilderness. According to Section 7.6.3, if a facility is less than 100 km from the Class I area, the AoI results are always at least three times higher than the PSAT results. Reducing the AoI sulfate contribution at Okefenokee Wilderness Area by a conservative factor of three results in a revised AoI sulfate contribution of approximately 0.76%. Therefore, this facility was not selected for a reasonable progress analysis as the weight of evidence supports the conclusion that this facility is likely not a significant contributor to visibility impairment at Okefenokee Wilderness Area and Wolf Island Wilderness.

- **SYMRISE (formerly RENESSENZ LLC) (12031-640111)** – This facility is 59.8 km from Okefenokee Wilderness Area and the AoI sulfate contribution is 1.96%. According to Section 7.6.3, if a facility is less than 100 km from the Class I area, the AoI results are always at least three times higher than the PSAT results. Reducing the AoI sulfate contribution by a conservative factor of three results in a revised AoI sulfate contribution is 0.65%. Therefore, this facility was not selected for a reasonable progress analysis as the weight of evidence supports the conclusion that this facility is likely not a significant contributor to visibility impairment at Okefenokee Wilderness Area and Wolf Island Wilderness.

- **SEMINOLE ELECTRIC COOPERATIVE, INC. (12107-2474411)** – This facility is 121.4 km from Okefenokee Wilderness Area and the AoI sulfate contribution is 3.25%. Also, this facility is 181.4 km from Wolf Island Wilderness and the AoI sulfate contribution is 1.77%. Therefore, this facility was selected for a reasonable progress analysis as the weight of evidence supports the conclusion that this facility is likely a significant contributor to visibility impairment at Okefenokee Wilderness Area and Wolf Island Wilderness.

- **C D McIntosh (12105-643111) –** This facility is 96.1 km from Chassahowitzka with an AoI sulfate contribution of 3.12%. According to Section 7.6.3, if a facility is less than 100 km from the Class I area, the AoI results are always at least three times higher than the PSAT results. Reducing the AoI sulfate contribution by a conservative factor of three results in a revised AoI sulfate contribution for Chassahowitzka of 1.04%. This facility is also 322.8 km from Everglades with an AoI sulfate contribution of 2.84%. SO_2 emissions used in the AoI analysis was 4,202 tpy. The highest SO_2 emissions in the last three years was 1,655.93 tpy in 2018. Scaling the AoI sulfate contribution of 1.04% and 2.84% by the ratio of 2018 to 2028 SO_2 emissions (1,655.93/4,202) results in a revised AoI sulfate contribution of 0.41% for Chassahowitzka and 1.12% for Everglades. Therefore, this facility was selected for a reasonable progress analysis as the weight of evidence supports the conclusion that this facility is likely a significant contributor to visibility impairment at Everglades.

Overall, this additional analysis added one Florida facility for reasonable progress review for Everglades and one Florida facility for reasonable progress review for Okefenokee and Wolf Island in Georgia. Overall, the AoI analysis, the PSAT analysis, and the additional analysis of sources that were not screened in through the AoI or PSAT process resulted in a reasonable set of sources for analysis consistent with 40 CFR 51.308(f)(2)(i) and EPA's 2019 Regional Haze Guidance.

Based on the analysis above, thirteen facilities were selected to evaluate additional controls for reasonable progress – eleven in Florida and two in other states. The Department considers this a reasonable set of sources for analysis, as it includes the largest sources of SO_2 within a reasonable distance from Class I areas, as well as other large sources located farther from the Class I areas. These set of selected sources represents eleven of the top 18 SO_2 emitting sources in 2019. The other nine sources of the top 18 sources that were not screened in through the AoI/PSAT methodology were not selected for reasonable progress analysis for the following reasons:

- OUC Stanton (2019 SO_2 emissions: 2,634 tons) – This facility's maximum AoI impacts were 2.31% at Everglades and it is 139 km to the nearest Class I area. This facility is also effectively controlled as it meets EPA's MATS rule. In addition, as discussed in Section 8.2.2., OUC Stanton has publicly committed to end coal-firing operations by 2027.
- Mosaic South Pierce (2019 SO_2 emissions: 2,044 tons) – This facility's maximum AoI impacts were 1.91% at Everglades and it is over 120 km to the nearest Class I area. This facility would likely be classified as an effectively-controlled unit as Mosaic installed new SO_2 controls similar to the controls installed in Mosaic Bartow and New Wales.
- Mosaic Riverview (2019 SO_2 emissions: 1,539 tons) – This facility's maximum AoI impacts were 2.14% at Chassahowitzka and it is 100 km to the nearest Class I area. This facility would likely be classified as an effectively-controlled unit as Mosaic installed new SO_2 controls similar to the controls installed in Mosaic Bartow and New Wales in order to comply with the 2010 SO_2 NAAQS.
- Breitburn Operating LP (2019 SO_2 emissions: 1,442 tons) – This facility's maximum AoI impacts were 0.29% at St. Marks and it is over 300 km to the nearest Class I area. This facility's large distance to the nearest Class I area was the primary justification for not selecting this facility for a reasonable progress evaluation.
- Gulf Clean Energy Center (Plant Crist) (2019 SO_2 emissions: 1,128 tons) – This facility's maximum AoI impacts were 1.64% at St. Marks and it is 300 km to the nearest Class I area. This facility has completed a recent fuel switch to firing only natural gas which has led to substantial reductions of SO_2 emissions.
- Deerhaven Generating Station (2019 SO_2 emissions: 600 tons) – This facility's maximum AoI impacts were 0.85% at Okefenokee and it is over 100 km to the nearest Class I area. As discussed in Section 8.2.2., this facility is currently implementing a fuel co-firing project that will allow this coal-fired unit to co-fire up to 100% natural gas which will lead to substantial reductions of SO_2 emissions in the future.
- Symrise (2019 SO_2 emissions: 569 tons) – See discussion above.

These top-18 sources of SO_2 in Florida accounts for approximately 35,000 tons of SO_2 emitting, which is the vast majority of all point source emissions in Florida. This supports the conclusion that Florida's list of selected sources was a reasonable set of sources to ensure reasonable progress during the second implementation period.

Table 7-25 contains a list of facilities in Florida selected for reasonable progress analysis. Table 7-26 contains a list of facilities in VISTAS States (not including Florida) selected for reasonable progress analysis.

Table 7-25: Facilities in Florida Selected for Reasonable Progress Analysis

State	Facility ID	Facility Name	Class I areas impacted in FL	Class I areas impacted outside FL
FL	12123-752411	Foley Cellulose, LLC Foley Mill		1
FL	12017-640611	Duke Crystal River Power Plant	1	
FL	12031-640211	JEA Northside Generating Station		1
FL	12105-717711	Mosaic New Wales	1	
FL	12105-919811	Mosaic Bartow	1	
FL	12089-753711	WestRock Fernandina Beach Mill		2
FL	12005-535411	WestRock Panama City Mill	1	
FL	12057-538611	TECO Big Bend Power Station	2	
FL	12047-769711	Nutrien White Springs Ag Chem		1
FL	12107-2474411	Seminole Generating Station		2
FL	12105-643111	CD McIntosh Power Plant	1	

Table 7-26: Facilities in VISTAS States (not including Florida) Selected for Reasonable Progress Analysis

State	Facility ID	Facility Name
GA	13015-2813011	Ga Power Company - Plant Bowen
KY	21145-6037011	Tennessee Valley Authority (TVA) - Shawnee Fossil Plant

The eleven Florida facilities listed in Table 7-25 were contacted during summer 2020 and asked to either demonstrate that units expected to emit at least 5 tpy SO_2 in 2028 were effectively-controlled, or to complete a full four-factor analysis for those units. The states of Georgia and Kentucky were contacted in December 2020 and asked to include the facilities listed in Table 7-26 in the state's reasonable progress analysis. Copies of these letters are in Appendix F.

7.6.4.1. Effective Controls Analyses

Eight selected facilities in Florida (five power plants and three phosphate fertilizer plants) have units that are effectively controlled, as summarized below, and are therefore unlikely to have additional controls available for reasonable progress. Please note that, consistent with the Department's approach to focus on SO_2 in the second planning period as discussed in Section 7.4, these effective controls analyses were specific to SO_2.

- **Duke Crystal River (12017-640611)** – This facility has accepted the MATS SO_2 limit of 0.2 pounds per million British thermal units (lbs/mmbtu) for the Fossil Fuel Steam Generating Unit 4 (EU004) and Unit 5 (EU003) in lieu of performing a detailed four-factor analysis for these units. This limit was incorporated by air construction permit and is included as part of the Florida Regional Haze SIP. The Citrus Combined Cycle Station Units 1A, 1B, 2A, and 2B (EU051, EU052, EU042, and EU043) are required by permit to combust only pipeline natural gas. This requirement is included as part of the Florida Regional Haze SIP.

- **JEA Northside (12031-640211) –** Circulating-fluidized bed Boiler 1 and 2 (EU026 and EU027) were already required by permit to meet an SO_2 limit of 0.15 lbs/mmbtu, which is more stringent than the MATS SO_2 limit of 0.2 lbs/mmbtu. This SO_2 limit is included as part of the Florida Regional Haze SIP.

- **TECO Big Bend (12057-538611) -** This facility has accepted the MATS SO_2 limit of 0.2 lbs/mmbtu for the Fossil Fuel Steam Generator No. 3 (EU003) and No. 4 (EU004) in lieu of performing a detailed four-factor analysis for these units. This SO_2 limit was incorporated by air construction permit and is included as part of the Florida Regional Haze SIP.

- **CD McIntosh, Jr. Power Plant (12105-643111)** –The Fossil Fuel Steam Generating Unit 3 (EU006) was permanently shutdown in 2021. Documentation of the permanent shutdown is included in Appendix G-3 in the formal SIP submittal.

- **Seminole Generating Station (12107-2474411) -** This facility has agreed to accept the MATS SO_2 limit of 0.2 lbs/mmbtu for the Steam Electric Generator No. 1 (EU001) and No. 2 (EU002) in lieu of performing a detailed four-factor analysis for these units. This SO_2 limit was incorporated by air construction permit and is included as part of the Florida Regional Haze SIP.

- **Nutrien White Springs Ag Chem (12047-769711) –** This facility has recently completed significant work to reduce SO_2 emissions to achieve SO_2 limits imposed by a Consent Decree.[55] As part of the Consent Decree, Nutrien was required to reduce SO_2 emissions and meet more stringent SO_2 emission limits at SAP C, D, E, and F. Nutrien elected to permanently shut down SAPs C and D in 2014, reducing SO_2 emissions from these SAPs to zero. On March 31, 2017, the Department issued permit No. 0470002-107-AC to Nutrien to complete upgrades on SAP E and SAP F, which included changing out and augmenting the converter catalyst in the SAPs, allowing them to meet new SO_2 emission limits of 2.6 lb/ton on a 3-hour rolling average (excluding startups and shutdowns) and 2.3 lb/ton on a 365 day rolling average (including startups and shutdowns), as required by the consent decree. Nutrien came into compliance with these limits on January 1, 2018 for SAP F and January 1, 2020 for SAP E. These limits are consistent with recent BACT determinations made for similar double-absorption, sulfur-burning SAPs. Therefore, these units are effectively controlled, and additional reasonable controls are unlikely to be found. These SO_2 limits are included as part of Florida's Regional Haze SIP.

[55] United States of America and Louisiana Department of Environmental Quality v. PCS Nitrogen Fertilizer, L.P., AA Sulfuric, Inc., and White Springs Agricultural Chemicals, Inc., available at: https://www.epa.gov/sites/production/files/2014-11/documents/pcsnitrogenfertilizer-cd.pdf

- **Mosaic New Wales (12105-717711) –** This facility has recently completed significant work to reduce SO_2 emissions to bring the Hillsborough-Polk nonattainment area into attainment for the 2010 SO_2 NAAQS. The five SAPs No. 1 through 5 (EU002, EU003, EU004, EU042, and EU044) are double absorption sulfuric acid systems with two absorption towers to react sulfur trioxide (SO_3) with water to generate sulfuric acid. The SO_2 generated in the double-absorption system's sulfur furnace is catalytically oxidized to SO_3 over catalyst beds at a rate of 99.7% or higher. The facility made significant expenditures to upgrade the vanadium catalyst in in the first, second, and third catalyst beds, and cesium catalyst in the fourth bed, which promotes conversion of SO_2 to SO_3 at lower temperatures. The facility was also required to comply with a five-unit cap of 1,090 lb/hr of SO_2 on a 24-hour block average as determined by CEMS. SAP No. 1-3 are each required to meet a limit of 3.5 lb SO_2 per ton of 100% sulfuric acid on a 24-hr rolling average, and 4 lb/ton on a 3-hr rolling average. SAPs 4 and 5 are each required to meet a limit of 4 lb/ton. SO_2 BACT determinations for sulfur burning, double-absorption sulfuric acid plants with cesium-promoted catalysts in EPA's RACT/BACT/LAER Clearinghouse database are in the range of 3.0 to 4.0 lb/ton. Therefore, these units are effectively controlled, and additional reasonable controls are unlikely to be found. These SO_2 limits are already approved into Florida's SIP, see 85 Fed. Reg. 9,666 (February 20, 2020).

- **Mosaic Bartow (12105-919811)** – This facility has recently completed significant work to reduce SO_2 emissions to bring the Hillsborough-Polk nonattainment area into attainment for the 2010 SO_2 NAAQS. The three SAPs No. 4 through 6 (EU012, EU033, and EU032) are double absorption sulfuric acid systems with two absorption towers to react SO_3 with water to generate sulfuric acid. The SO_2 generated in the double-absorption system's sulfur furnace is catalytically oxidized to SO_3 over catalyst beds at a rate of 99.7% or higher. The facility made significant expenditures to upgrade the vanadium catalyst in in the first, second, and third catalyst beds, and cesium catalyst in the fourth bed, which promotes conversion of SO_2 to SO_3 at lower temperatures. The facility was also required to comply with a three-unit cap of 1,100 lb/hr on a 24-hour block average as determined by CEMS. SAP No. 4-6 are each required to meet a limit of 4 lb/ton of 100% sulfuric acid. SO_2 BACT determinations for sulfur burning, double-absorption sulfuric acid plants with cesium-promoted catalysts in EPA's RACT/BACT/LAER Clearinghouse database are in the range of 3.0 to 4.0 lb/ton. Therefore, these units are effectively controlled, and additional reasonable controls are unlikely to be found. These SO_2 limits are already approved into Florida's SIP, see 85 Fed. Reg. 9,666 (February 20, 2020).

For those units relying on the MATS SO_2 limit, Table 7-27 below compares the annual lb/MMBtu SO_2 emissions rate to the MATS SO_2 limit of 0.2 lb/MMBtu. As shown in the table, most units have an annual emission rate of approximately 0.14 lb/MMBtu. In general, the highest 30-day average for SO_2 emissions is approximately 0.16 to 0.19 lb/MMBtu. The compliance margin for these units is approximately 20%. The Department considers these compliance margins reasonable and that it is reasonable for these units to rely on the MATS SO_2 limit of 0.2 lb/MMBtu.

TECO Big Bend Unit 3, however, is shown to be operating significantly below the 0.2 lb/MMBtu SO_2 limit in recent years. This is due to Unit 3 burning significantly more natural gas. However, TECO Big Bend reserves the ability to burn coal for operational flexibility. When Unit 3 used to burn coal, Unit 3 operated with a similar compliance margin to Unit 4. In addition, TECO has announced that Unit 3 will be retired in 2023.

For Nutrien White Springs, SO_2 emissions from SAPs E and F have approached the 3-hour permitted SO_2 emission limit of 2.6 pound per ton of 100% sulfuric acid (lb/ton). Although recently the long-term SO_2 emissions have operated in the range of 1.0 to 1.1 lb/ton (as compared to the long-term rolling average permit limit of 2.3 lb/ton), this is because the SAPs are operating well below the permitted production rate of 2,750 tons per day. In addition, the D catalyst beds of each SAP is loaded with new, high-efficiency vanadium/cesium catalyst and new vanadium catalyst has been added to the A, B, and C catalyst beds in preparation for the production rate of 2,750 tons per day that has not yet been achieved. All of this serves to decrease SO_2 emissions. However, as the production rate increases closer to the permitted limit of 2,750 tons per day and as the catalyst ages, it is expected that the 365-day rolling average SO_2 emission rate will approach the permitted limit of 2.3 lb/ton. Therefore, the Department considers the current permitted SO_2 limits to be reasonable for the SAPs at Nutrien White Springs.

For the New Wales and Bartow facilities, the limits that are being used for Regional Haze purposes are already in Florida's SIP as part of Florida's Maintenance SIP for the Hillsborough-Polk SO_2 Maintenance Area. *See* 85 Fed. Reg. 9,666 (February 20, 2020). The Department is not proposing to include the production-based SO_2 emission limits as discussed in the comments. The SAPs currently operate at up to 99% of their permitted SO_2 caps of 1,090 lbs/hr and 1,100 lbs/hr, respectively. Therefore, the Department considers the current permitted SO_2 limits to be reasonable for all effectively-controlled units at Mosaic New Wales and Mosaic Bartow.

Table 7-27: Comparison of the actual SO_2 lb/MMBtu emission rate and the MATS SO_2 limit of 0.2 lb/MMBtu

Facility Name	Unit ID	Year	SO_2 (tons)	Heat Input (MMBtu)	Annual SO_2 lb/MMBtu	Percent of 0.2 lb/MMBtu Limit*	3-yr Average SO_2	3-yr Average MMBtu	SO_2 lb/MMBtu
Duke Crystal River	4	2016	3,144	4.24E+07	0.148	74%			
Duke Crystal River	4	2017	3,510	4.53E+07	0.155	77%			
Duke Crystal River	4	2018	3,152	4.30E+07	0.146	73%	3,269	4.36E+07	0.150
Duke Crystal River	4	2019	1,990	3.03E+07	0.131	66%	2,884	3.96E+07	0.146
Duke Crystal River	4	2020	1,045	1.52E+07	0.137	69%	2,062	2.95E+07	0.140
Duke Crystal River	5	2016	3,179	4.34E+07	0.147	73%			
Duke Crystal River	5	2017	3,133	4.10E+07	0.153	76%			
Duke Crystal River	5	2018	3,365	4.80E+07	0.140	70%	3,225	4.41E+07	0.146
Duke Crystal River	5	2019	1,189	1.87E+07	0.127	64%	2,562	3.59E+07	0.143
Duke Crystal River	5	2020	1,588	2.21E+07	0.144	72%	2,047	2.96E+07	0.138
JEA Northside	1A	2016	1,297	1.75E+07	0.148	99%			
JEA Northside	1A	2017	891	1.20E+07	0.148	99%			
JEA Northside	1A	2018	1,525	2.06E+07	0.148	99%	1,238	1.67E+07	0.148
JEA Northside	1A	2019	1,601	2.17E+07	0.147	98%	1,339	1.81E+07	0.148
JEA Northside	1A	2020	1,446	1.93E+07	0.150	100%	1,524	2.05E+07	0.148
JEA Northside	2A	2016	1,536	2.07E+07	0.148	99%			
JEA Northside	2A	2017	548	7.44E+06	0.147	98%			
JEA Northside	2A	2018	725	1.01E+07	0.143	95%	936	1.28E+07	0.147
JEA Northside	2A	2019	292	3973575.17	0.147	98%	521	7.19E+06	0.145
JEA Northside	2A	2020	839	1.14E+07	0.147	98%	619	8.50E+06	0.146
Seminole Generating Station	1	2016	3,165	3.98E+07	0.159	79%			
Seminole Generating Station	1	2017	2,537	3.49E+07	0.146	73%			
Seminole Generating Station	1	2018	2,970	4.15E+07	0.143	72%	2,891	3.87E+07	0.149
Seminole Generating Station	1	2019	2,264	3.46E+07	0.131	65%	2,590	3.70E+07	0.140
Seminole Generating Station	1	2020	2,206	3.09E+07	0.143	71%	2,480	3.56E+07	0.139

Facility Name	Unit ID	Year	SO_2 (tons)	Heat Input (MMBtu)	Annual SO_2 lb/MMBtu	Percent of 0.2 lb/MMBtu Limit*	3-yr Average SO_2	3-yr Average MMBtu	SO_2 lb/MMBtu
Seminole Generating Station	2	2016	2,679	3.50E+07	0.153	76%			
Seminole Generating Station	2	2017	3,071	4.22E+07	0.145	73%			
Seminole Generating Station	2	2018	2,668	3.80E+07	0.140	70%	2,806	3.84E+07	0.146
Seminole Generating Station	2	2019	2,299	3.75E+07	0.123	61%	2,680	3.93E+07	0.136
Seminole Generating Station	2	2020	2,769	3.74E+07	0.148	74%	2,579	3.77E+07	0.137
TECO Big Bend	BB03	2016	1,089	1.81E+07	0.120	60%			
TECO Big Bend	BB03	2017	1,007	1.39E+07	0.145	73%			
TECO Big Bend	BB03	2018	1,071	2.02E+07	0.106	53%	1,056	1.74E+07	0.121
TECO Big Bend	BB03	2019	48	1.32E+07	0.007	4%	709	1.58E+07	0.090
TECO Big Bend	BB03	2020	59	1.79E+07	0.007	3%	392	1.71E+07	0.046
TECO Big Bend	BB04	2016	1,896	2.85E+07	0.133	66%			
TECO Big Bend	BB04	2017	2,255	2.75E+07	0.164	82%			
TECO Big Bend	BB04	2018	2,100	2.63E+07	0.160	80%	2,084	2.74E+07	0.152
TECO Big Bend	BB04	2019	1,102	1.64E+07	0.135	67%	1,819	2.34E+07	0.156
TECO Big Bend	BB04	2020	790	1.26E+07	0.125	63%	1,331	1.84E+07	0.145

7.6.5. Evaluation of Recent Emission Inventory Information

The Regional Haze Rule at 40 CFR 51.308(f)(2)(iii) requires the state to document the emissions information on which the state is relying to determine the emission reduction measures that are necessary to make reasonable progress in each mandatory federal Class I area it affects. The emissions information must include, but need not be limited to, information on emissions in a year at least as recent as the most recent year for which the state has submitted emission inventory information to the EPA Administrator in compliance with the triennial reporting requirements.

Florida examined the 2017, 2018, and 2019 emission information that has been reported to EPA and compared these emissions to the 2028 emissions that were used in the modeling.

Table 7-28 shows all the facilities with SO_2 emissions greater than 100 tpy in 2017. The table is sorted from highest emissions in 2017 to lowest. In addition to 2017 emissions, the table has 2018 and 2019 emissions, if available. Projected emissions for 2028 are also shown. One column has the 2028 original value that was used in the first run on the model, and another column has the 2028 remodel value that was used in the second run of the model.

Large differences (greater than 1,000 tpy) between 2028 remodel emissions and 2017, 2018, and 2019 emissions are noted for the following reasons:

- Duke Crystal River shut down the fossil fuel fired steam generator Units 1 and 2 which were significant sources of SO_2 emissions. The VISTAS modeled emissions for Crystal River were updated to reflect these unit shut downs. The remaining two fossil fuel fired steam generator units are still significant sources of SO_2.
- As described in Section 7.6.4.1, Mosaic New Wales has recently completed significant work to reduce SO_2 emissions which brought the Hillsborough-Polk nonattainment area back into attainment for the 2010 SO_2 NAAQS. The facility made significant expenditures to upgrade the vanadium catalyst and is complying with a five-unit cap of 1,090 lb/hr on a 24-hour block average as determined by CEMS. The VISTAS modeled emissions reflect these emissions decreases.
- Seminole Generating Station has a permit to shut down one of the fossil fuel-fired steam EGUs (either Unit 1 or Unit 2). The VISTAS modeled emissions reflect the expected decrease in emissions that will result from shutting down one of these units.
- JEA has shut down the St. Johns River Power Park (SJRPP) Boilers 1 and 2, leaving only significant SO_2 emissions from the Northside plant. The VISTAS modeled emissions reflect the significant reduction in emissions resulting in shutdown of the SJRPP boilers.
- TECO Big Bend has shut down Unit 1, which is being repowered with a new NGCC. Big Bend Unit 2 has been converted to natural gas only, and Unit 3 is currently firing natural

gas only but continues to have coal-firing capabilities. Units 2 and 3 are expected to be shut down by the end of 2023. Unit 4 has also been permitted to fire natural gas and is expected to co-fire coal and natural gas for the foreseeable future. The VISTAS modeled emissions are conservatively high compared to recent operational changes, as the VISTAS model projected coal-firing in Units 3 and 4 through 2028.

- WestRock Fernandina Beach has completed significant work to reduce both actual and allowable SO_2 emissions to bring the Nassau County area back into attainment for the 2010 SO_2 NAAQS. This work includes air system changes and installation of a liquor heater for the No. 4 Recovery Boiler, combustion control automation and conversion of auxiliary fuel from No. 6 fuel oil to Ultra-Low Sulfur Diesel (ULSD) for both recovery boilers, elimination of the use of the No. 5 Power Boiler as a backup control device for pulp mill non-condensable gases, and installation of a white liquor scrubber to reduce the sulfur content of the non-condensable gases (NCGs) prior to combustion in the No. 7 Power Boiler, which became the backup NCG control device in place of the No. 5 Power Boiler. With these projects, the SO_2 emission limit for the No. 5 Power Boiler was reduced from 550 pounds per hour (lb/hr) to 15 lb/hr. Additionally, the mill implemented an evaporator project in 2020 to increase black liquor solids content, which helps stabilize operation of the recovery boilers, allowing for improved SO_2 emissions. The VISTAS modeled emissions are conservatively high compared to recent actual emissions because the Mill has recently been using much less coal and much more natural gas, which has reduced actual SO_2 emissions. In fact, this is a selected facility that performed a four-factor analysis and the Department plans to require the facility to cap coal usage to reflect this decrease.
- For Lakeland CD McIntosh, the VISTAS modeled emissions include emissions from the coal-fired steam generator Unit 3 (EU006) which has been permanently shutdown in 2021. Though the remaining units at the facility are permitted to burn distillate fuel oil, these units burn mainly natural gas and are expected to continue to operate this way; therefore, SO_2 emissions from CD McIntosh will be significantly lower than what was modeled and the modeled emissions are conservatively high. Actual SO_2 emissions from the remaining units at the facility have totaled less than 5 tons per year during 2017 through 2019.
- There are no emissions from Mosaic Plant City after 2017 because the four SAPs at the facility have not operated since December 2017, and the facility was officially shut down November 21, 2019. The VISTAS modeled emissions reflect this shut down.
- WestRock Panama City Mill has significantly reduced SO_2 emissions since 2011 through reduced use of No. 6 fuel oil and coal, reducing HCl emissions which in turn tend to reduce SO_2 emissions, and other improvements to operation. VISTAS modeled emissions do not reflect these recent changes and are conservatively high and reflect the facility using a fuel mix with higher SO_2-emitting fuels. This facility underwent a four-factor analysis.

Table 7-28: SO_2 Emissions Comparison Between 2017, 2018, 2019, and 2028

EIS Facility ID	Facility	SO_2 2011 (tpy)	SO_2 2017 (tpy)	SO_2 2018 (tpy)	SO_2 2019 (tpy)	SO_2 2028 VISTAS Original (tpy)	SO_2 2028 VISTAS Remodel (tpy)	2028 Remodel Minus 2017	2028 Remodel Minus 2018	2028 Remodel Minus 2019
0170004	CRYSTAL RIVER POWER PLANT	26,162	12,734	10,974	3,201	5,306	2,614	-10,120	-8,360	-587
1050059	MOSAIC FERTILIZER - NEW WALES FACILITY	7,901	6,887	6,147	4,556	3,581	4,491	-2,396	-1,656	-65
1070025	SEMINOLE GENERATING STATION	14,970	5,608	5,638	4,563	3,713	3,713	-1,895	-1,925	-850
0310045	NORTHSIDE GENERATING STATION	14,917	4,998	2,474	1,917	2,094	2,150	-2,848	-324	233
0570039	BIG BEND STATION	9,106	4,626	3,178	1,152	6,085	6,085	1,459	2,907	4,933
1050046	MOSAIC FERTILIZER, LLC - BARTOW FACILITY	4,426	4,001	4,061	4,131	3,614	4,301	300	240	170
0950137	STANTON ENERGY CENTER	2,402	3,041	2,374	2,634	2,691	2,691	-350	317	57
0890003	FERNANDINA BEACH MILL	3,717	2,297	1,741	989	2,607	2,607	310	866	1,618
0470002	NUTRIEN WHITE SPRINGS PHOS, SWA RIV & SW	3,229	1,753	1,982	1,462	2,745	1,557	-196	-425	95
1050055	MOSAIC FERTILIZER - SOUTH PIERCE FAC.	1,123	1,627	2,248	2,044	1,123	1,553	-74	-695	-491
1230001	FOLEY MILL	1,618	1,538	1,718	2,065	1,520	1,520	-18	-198	-545
1130005	BREITBURN ST REGIS GAS TREATING FACILITY	683	1,491	1,242	1,442	687	687	-804	-555	-755
0570008	MOSAIC FERTILIZER-RIVERVIEW FACILITY	3,034	1,487	1,407	1,539	1,890	1,804	317	397	265
1050004	C.D. MCINTOSH, JR. POWER PLANT	4,257	1,459	1,656	848	4,202	4,202	2,743	2,546	3,354
0570005	MOSAIC FERTILIZER -PLANT CITY FACILITY	1609	1,217	0	0	0	0	-1,217	0	0
1050233	POLK POWER STATION	1,263	1,045	610	14	359	359	-686	-251	345
0050009	WESTROCK PANAMA CITY MILL	2,392	1,016	666	461	2,591	2,591	1,575	1,925	2,130
0310039	JACKSONVILLE FACILITY – SYMRISE INC.	571	825	823	569	570	570	-255	-253	1
0112094	MONARCH HILL	175	630	654	424	175	175	-455	-479	-249
0330045	GULF CLEAN ENERGY CENTER (CRIST)	2,526	498	742	1,128	2,616	572	74	-170	-556

EIS Facility ID	Facility	SO_2 2011 (tpy)	SO_2 2017 (tpy)	SO_2 2018 (tpy)	SO_2 2019 (tpy)	SO_2 2028 VISTAS Original (tpy)	SO_2 2028 VISTAS Remodel (tpy)	2028 Remodel Minus 2017	2028 Remodel Minus 2018	2028 Remodel Minus 2019
0310071	IFF CHEMICAL HOLDINGS, INC.	859	494	634	404	899	899	405	265	495
0850001	MARTIN POWER PLANT	599	395	521	25	20	34	-361	-487	9
0010006	DEERHAVEN GENERATING STATION	2,041	387	530	600	881	881	494	351	281
0810010	MANATEE POWER PLANT	1,653	376	525	426	206	206	-170	-319	-220
0890004	RAYONIER FERNANDINA SULFITE PLANT	562	247	217	191	562	562	315	345	371
1070005	PALATKA MILL	1,235	219	215	237	756	756	537	541	519

7.7. Evaluating the Four Statutory Factors for Specific Emissions Sources

Section 169A(g)(1) of the CAA and the Regional Haze Rule at 40 CFR 51.308(f)(2)(i) require a state to evaluate the following four "statutory" factors when establishing the RPG for any Class I area within a state: (1) cost of compliance, (2) time necessary for compliance, (3) energy and non-air quality environmental impacts of compliance, and (4) remaining useful life of any existing source subject to such requirements.

On August 20, 2019, EPA issued a memorandum entitled "Guidance on Regional Haze State Implementation Plan for the Second Implementation Period." This memorandum included guidance for characterizing the four statutory factors including which emission control measures to consider, selection of emission information for characterizing emissions-related factors, characterizing the cost of compliance (statutory factor 1), characterizing the time necessary for compliance (statutory factor 2), characterizing energy and non-air environmental impacts (statutory factor 3), charactering remaining useful life of the source (statutory factor 4), characterizing visibility benefits, and reliance on previous analysis and previously approved approaches. The memorandum also contains guidance on decisions on what control measures are necessary to make reasonable progress. This guidance was used in evaluating the four statutory factors for the Foley Mill, JEA (one unit), WestRock Panama City, and Westrock Fernandina Beach facilities in Florida selected for reasonable progress analysis. The results of these analyses are found in Section 7.8.

7.8. Control Measures Representing Reasonable Progress for Individual Sources to be Included in the Long-Term Strategy

The following summarizes the process for determining reasonable progress for Florida sources and whether to implement reasonable progress controls or measures.

The Department requested that eleven facilities in Florida complete a reasonable progress analysis. Pursuant to EPA's 2019 Regional Haze Guidance, the Department allowed these facilities to either demonstrate that units that are large sources of SO_2 (greater than five tons per year) were already effectively controlled or complete a four-factor analysis. Many of these facilities provided the Department an analysis demonstrating that units that were large sources of SO_2 at these facilities were effectively controlled, and where necessary, applied for an air construction permit codifying those controls as reasonable progress limits (these analyses are documented in Section 7.6.4.1).

Four-factor analyses were completed for units at four facilities, consistent with EPA's Cost Control Manual and the 2019 Regional Haze Guidance. The Department used these analyses to determine whether a given control measure is cost-effective.

Below is a summary of the four-factor analysis completed for units at Foley Mill, JEA Northside, WestRock Panama City, and WestRock Fernandina Beach. For a detailed discussion of the reasonable progress assessments, see Appendix G-2.

7.8.1. JEA Northside Four-Factor Analysis

The Northside Generating Station (NGS) is a power plant located in north Jacksonville owned and operated by JEA. The main SO_2 emissions sources at the NGS are circulating fluidized-bed (CFB) Boiler Nos. 1 and 2 (EUs 026 and 027) and Boiler No. 3 (EU 003). NGS Units 1 and 2 are equipped with selective non-catalytic reduction (SNCR) system to control NO_X emissions and limestone injection and spray dryer absorber (SDA) to control SO_2 emissions. As explained in Section 7.6.4.1, Units 1 and 2 are effectively-controlled and thus the Department did not require a four-factor analysis for these units.

NGS Unit 3 does not have add-on controls for SO_2. NGS Unit 3 began commercial operation in 1977 and has a maximum design heat input of 5,260 MMBtu/hr for firing natural gas and 5,033 MMBtu/hr for firing No. 6 fuel oil. Sulfur content of No. 6 fuel oil is limited to 1.8% by weight. Although fuel oil firing is not limited, Unit 3 currently meets the definition of a natural gas-fired electric utility steam generating unit as defined in 40 CFR 63.10042, based on its limited use of oil, and thus is exempt from the requirements of MATS. The current Title V permit has a permitting note stating that if the unit becomes an oil-fired electric utility steam generating unit as defined in 40 CFR 63.10042, it will be subject to the applicable requirements of MATS. An oil-fired electric utility steam generating unit is defined as a unit that burns oil for more than 10.0% of the average annual heat input during the 3 previous calendar years or for more than 15.0% of the annual heat input during any one of those calendar years. As reflected by the unit's exempt status as related to MATS, oil firing in NGS Unit 3 has been less than 10% of the annual heat input on average, which is equivalent to 876 hours per year at full capacity. A four-factor analysis was conducted for feasible controls identified for this unit.

Table 7-29 shows Unit 3 emissions from 2011 (the base year used in the VISTAS modeling), through 2020, and projected 2028 emissions. Because projected 2028 emissions were somewhat low compared with recent actual emissions, the four-factor analysis uses the 2-year average SO_2 emissions from 2018-2019.

Table 7-29: SO_2 emissions (tpy) from JEA Northside Unit 3

Year	EU003 – Boiler No. 3
2011	312.0
2012	147.5
2013	20.8
2014	109.1

2015	107.8
2016	208.3
2017	46.9
2018	223.4
2019	23.7
2020*	102.1
Projected 2028	56.0

*Preliminary

7.8.1.1. NGS Unit 3 (EU003)

Unit 3 is a natural gas-fired boiler that also burns very limited amounts of fuel oil. As discussed above, Unit 3 is not subject to the requirements of MATS. The types of available post-combustion controls consist primarily of flue gas desulfurization (FGD) systems. These are typically applied to coal and oil-fired combustion units. Though feasible, use of a wet or dry FGD system for gas-fired boilers similar to Unit 3 is uncommon. Available controls identified for Unit 3 include using lower sulfur No. 6 fuel oil, lower sulfur No. 2 fuel oil, or an FGD system.

7.8.1.1.1. Estimated Costs of Compliance

JEA prepared a cost analysis for switching to either lower sulfur No. 6 or No. 2 fuel oil following EPA's Control Cost Manual. JEA performed an engineering analysis to determine what changes would be needed at the facility in order to implement a fuel switch. The 1.0% sulfur fuel oil has much less viscosity than the 1.8% sulfur fuel oil and therefore, modifications are needed for the unit to accept the lower viscosity fuel. JEA determined that a modification cost of approximately $1,000,000 will be needed, which includes inspection of burner and booster pumps, burner tuning/optimization, replacement of instrumentation, and test burns to determine boiler performance. For burning No. 2 fuel oil, new burners will be needed for a minimum cost of $1,000,000. A new fuel oil tank will not be needed for lower sulfur No. 6 fuel oil since the facility already burns No. 6 fuel oil and the existing fuel tank can be used to hold the lower sulfur fuel oil. However, for switching to No. 2 fuel oil, a new tank will be needed. According to JEA's estimates, a new No. 2 fuel oil tank and associated piping will cost approximately $6,000,000. The direct operating cost associated with the lower sulfur fuel oil usage was estimated based on the cost of the less than 1% sulfur No. 6 oil or ultra-low-sulfur No. 2 oil for the amount equal to the baseline fuel oil usage. JEA used a 20-year life and 7% interest rate for estimating capital recovery cost.

JEA developed the cost calculation for adding an FGD system using capital, fixed operation and maintenance (O&M) and variable O&M costs that are available on a $/kW basis as part of EPA's Integrated Planning Model (IPM) Base Case v. 4.10 (9-1-2010) for Transport Rule;

Documentation; Chapter 5, Emission Control Technologies. These cost models were developed by engineering contractors such as Sargent & Lundy for the wet-FGD cost model. Additionally, cost factors from the EPA Cost Control Manual Sixth Edition (January 2002) were used to include those costs not included in the EPA IPM cost model. Annualized costs were developed using the methodology in the EPA Cost Control Manual. The annualized cost was for an FGD system was estimated to be $39.0 million. A 98% control efficiency was assumed for the FGD system.

JEA's initial cost effectiveness values were:

- Switching to a lower sulfur No. 6 fuel oil - $6,969/ton of SO_2 removed;
- Switching to No. 2 fuel oil - $19,881/ton of SO_2 removed; and
- Wet FGD system – $324,141/ton of SO_2 removed.

The Department updated some parts of the analysis that were not justified adequately or were inconsistent with EPA's Cost Control Manual. In all calculations, JEA used a 7% interest rate instead of 3.25% (the current bank prime interest rate), used a 20-year lifetime, and included property taxes, insurance, and administration costs in the direct operating costs, which were not justified. In the fuel switch cost calculations, JEA also included an additional contingency factor, used an incorrect value for the estimated fuel usage which overestimated the cost for estimated fuel usage, and included a $0.09 transportation fee for ULSD without sufficient justification. In the FGD cost calculations, JEA also did not justify the cost factors used to calculate the total equipment cost and direct operating costs although the Department determined that an update to these cost factors was not needed to determine whether an FGD system was or was not cost effective. All of these issues led to higher cost effectiveness values. The Department revised the cost effectiveness calculations. Table 7-30 shows the revised cost calculations for the two fuel switch options. Revised calculations for the wet FGD system are not included because the updated costs remain an order of magnitude above a reasonable cost-effectiveness threshold. The revised values are:

- Switching to a lower sulfur No. 6 fuel oil - $3,053/ton of SO_2 removed;
- Switching to No. 2 fuel oil - $7,334/ton of SO_2 removed; and
- Wet FGD system – $177,856/ton of SO_2 removed.

The Department's updated calculations demonstrate that switching to No. 2 fuel oil or implementing a wet FGD system are still not cost effective. With the updated calculation, the Department considers switching to a lower sulfur No. 6 fuel oil (1.0% or less) to be cost-effective.

Table 7-30: Northside Unit 3 Final Revised Cost Effectiveness Analysis for Fuel Switch Options

Cost Items	Cost Factors	Case 1 No. 6 Fuel Oil ≤1.0% S Fuel	Case 2 No. 2 Fuel Oil (0.05%S or ULSD)
DIRECT CAPITAL COSTS (DCC):		**$0**	**$7,000,000**
(1) Equipment Cost			
(a) New Fuel Oil Storage tank	New tank will not be needed	$0	$6,000,000
(b) Pumps, piping, etc.	NA	$0	$0
(c) New oil guns/atomizer sprayer plates	New fuel injectors for No. 2 oil	$0	$1,000,000
(3) Sales Tax	NA	$0	$0
Total Equipment Cost (TEC)		$0	$7,000,000
(4) Direct Installation Costs	NA	$0	$0
INDIRECT CAPITAL COSTS (ICC)		**$1,000,000**	**$3,450,000**
(1) Indirect Installation Costs			
(a) Engineering	10% of TEC	$0	$700,000
(b) Construction & Field Expenses	10% of TEC	$0	$700,000
(c) Construction Contractor Fee	10% of TEC	$0	$700,000
(d) Contingencies	3% of TEC	$0	$210,000
(e) Modifications to Unit 3 b	Unit 3 modifications to accept lower sulfur fuel, JEA data	$1,000,000	$1,000,000
(2) Other Indirect Costs			
(a) Startup	1% of TEC	$0	$70,000
(b) Perfromance Tests	1% of TEC	$0	$70,000
TOTAL CAPITAL INVESTMENT (TCI)	**DCC + ICC**	**$1,000,000**	**$10,450,000**
DIRECT OPERATING COSTS (DOC)		**$99,666**	**$350,154**
(1) Variable operating and maintenance costs	Assumed zero	$0	$0
Differential Fuel Cost (From >1.0%S to ≤1.0%S)	$1.53/gal - $1.04/gal, 882,000 gallons/yr	$99,666	--
Differential Fuel Cost (From >1.0%S No. 6 oil to ULSD)	$1.437/gal - $1.04/gal, 882,000 gallons/yr	--	$350,154
CAPITAL RECOVERY COSTS (CRC)	**CRF x TCI, 3.25% @ 30 years (CRF = 0.0527)**	**$52,682**	**$550,524**
ANNUALIZED COSTS (AC)	**DOC + CRF**	**$152,348**	**$900,678**
Baseline emissions, avg. for 2018-2019	tons of SO2 per year	122.9	122.9
Projected Emissions, Case 1	tons of SO2 per year	73	--
Projected Emissions, Case 2	tons of SO2 per year	--	0.09
Emissions Reduction		49.9	122.81
COST EFFECTIVENESS, $/ton		**$3,053**	**$7,334**

7.8.1.1.2. Time Necessary for Compliance

JEA estimates that the time necessary to complete the fuel switching would be approximately nine months to a year. A boiler outage of approximately two to three months would be necessary to perform the new burner installation.

Installing a wet FGD system is expected to take longer due to the need for engineering design, equipment procurement and installation, and installation and testing. EPA's IPM model estimates the engineering, procurement and installation would take about 36 months.

7.8.1.1.3. Energy and Non-Air Quality Impacts of Compliance

There are no energy impacts associated with using lower sulfur fuel oil since the heating value is expected to remain the same with lower sulfur content. Use of lower sulfur fuel oil also does not result in any non-air quality environmental impacts.

Wet-FGD has considerable energy penalties due to the pressure drop through the absorbers and the energy usage by auxiliary systems. The latter included limestone preparation, pumps for limestone slurry, fans for forced oxidation, etc. The pressure drop will be about 8 inches, which will require about 0.5% of the power generated. The auxiliary systems require about 2.5% of the power produced. The total energy impacts would be about 30,000 MWh for the maximum possible operation of Unit 3 currently authorized.

Operation of wet-FGD will also require the delivery, handling and storage of limestone, and the handling and disposal of FGD by-product (i.e., gypsum). In addition, process water is required that results from flue gas quenching, limestone slurry preparation and flue gas saturation. The delivery of limestone and removal of FGD byproducts from the plant would generate significant amount of truck trips in and out of the plant.

7.8.1.1.4. Remaining Useful Life

JEA is evaluating retirement of Unit 3 but has no definitive plans to shut it down yet. It is however, expected to remain in service for no longer than 20 years. However, the Department conservatively used a remaining useful life of 30 years in estimating the annualized costs of controls in the revised cost-effectiveness calculations.

7.8.1.1.5. Summary of Findings for NGS Unit 3 (EU0003)

The primary factor that the Department used to determine whether a control or measure is necessary for reasonable progress was the cost of compliance. The Department then further considered the other three factors (time necessary for compliance, energy and non-air quality impacts, and remaining useful life). Remaining useful life in this case is already considered in the costs factor through annualizing the costs of compliance.

For Unit 3, the Department does not consider installing an FGD system or switching to No. 2 fuel oil to be cost-effective and therefore, are not necessary for reasonable progress. The Department has determined that switching to lower sulfur No. 6 fuel oil is a cost-effective control available to NGS Unit 3. Given that JEA can timely implement a fuel switch and there are no energy or non-air environmental impacts, the Department has determined that switching to lower sulfur No. 6 fuel oil is necessary for reasonable progress. JEA is, however, evaluating retirement of Unit 3 but has no definitive plans to shut it down yet. JEA has 5.5 million gallons of 1.7% No. 6 fuel oil in the storage tanks and has not purchased any fuel to re-fill the tanks in many years. The Department is allowing for the possibility that JEA will use the remaining fuel over the next five years and decide to shut down the unit as there is no available backup fuel remaining. Thus, the Department will require JEA to either begin firing only fuel oil with sulfur content less than or equal to 1% in 2026, or shut down the unit by the end of 2028. The Department will require these conditions through permit No. 0310045-057-AC:

- Purchase of Fuel Oil Sulfur Limit: Upon issuance of this final permit, the permittee shall be prohibited from buying any fuel oil with a sulfur content greater than 1.0 percent by weight.
- Future Operation of Boiler No. 3: No later than January 1, 2026, the permittee shall determine either that going forward Boiler No. 3 shall only fire fuel oil with a sulfur content of 1.0 percent or less by weight or that Boiler No. 3 shall be permanently shut down effective December 31, 2028.
- Notification of Future Operation of Boiler No. 3: The permittee shall notify the Permitting Authority by a letter signed by the Responsible Office no later than December 1, 2025 which of the boiler operation options has been chosen.

These requirements will be included as part of Florida's Regional Haze SIP.

7.8.2. WestRock Fernandina Beach Four-Factor Analysis

WestRock Fernandina Beach Mill is a fully integrated Kraft linerboard mill that produces linerboard from wood pulp and pulp derived from recycled corrugated containers. The manufacturing processes at the Mill consist of the following major plant operations: wood yard, pulp mill, recycle plant, chemical recovery, powerhouse, and paper mill. A container plant (box plant) also operates onsite, converting linerboard into corrugated containers.

The mill conducted projects totaling $15.9 million in capital costs in 2016 and 2017 to reduce both actual and allowable SO_2 emissions so that modeled allowable emissions would demonstrate compliance with the 2010 SO_2 NAAQS. These projects included air system changes and installation of a liquor heater for the No. 4 Recovery Boiler, combustion control automation and conversion of auxiliary fuel from No. 6 fuel oil to ULSD for both recovery boilers, elimination of the use of the No. 5 Power Boiler as a backup control device for pulp mill non-condensable gases, and installation of a white liquor scrubber to reduce the sulfur content of the NCGs prior to combustion in the No. 7 Power Boiler, which became the backup NCG control device in place of the No. 5 Power Boiler. With these projects, the SO_2 emission limit for the No. 5 Power Boiler was reduced from 550 pounds per hour (lb/hr) to 15 lb/hr. Additionally, the mill implemented an evaporator project in 2020 to increase black liquor solids content, which helps stabilize operation of the recovery boilers, allowing for improved SO_2 emissions.

The largest SO_2 sources at the Mill are the No. 5 and No. 7 Power Boilers, and the No. 4 and No. 5 Recovery Boilers. The No. 5 Power Boiler burns carbonaceous fuel and/or No. 2 fuel oil. This unit is prohibited from use as a backup NCGs control device. The No. 7 Power Boiler fires coal, oil and/or natural gas, and serves as a backup NCGs control device. The No. 4 Recovery Boiler fires Black Liquor Solids and/or No. 2 fuel oil and uses natural gas and/or No. 2 fuel oil for startup. The No. 5 Recovery Boiler fires Black Liquor Solids and/or No. 6 fuel oil and burns natural gas and/or No. 2 fuel oil for startup only. Table 7-31 shows the most recent SO_2 emissions from each of these units, excluding de minimis units emitting less than 5 tpy. Considering the significant changes implemented in recent years, as described above, the original projected emissions for 2028 are now too high. Emissions from each unit have dropped significantly in the last several years, and the facility intends to continue operating closer to these levels in the future. The facility used emissions estimates in the four-factor analyses that are more in line with recent actual emission and how the facility intends to operate in the future (see last row in Table 7-31).

Table 7-31: SO_2 Emissions from Units at WestRock Fernandina Beach Mill

Year	Total	No. 5 PB – EU006	No. 7 PB – EU015	No. 4 RB – EU007	No. 5 RB – EU011
2011	3,615.9	237.7	3,160.7	113.1	104.4
2012	3,277.0	224.9	2,899.3	87.4	65.4
2013	3,117.0	60.3	2,793.5	134.3	128.9
2014	3,446.6	175.7	3,022.9	104.1	143.9
2015	3,068.8	181.8	2,762.7	50.4	73.9
2016	2,274.7	127.1	2,034.1	68.8	44.7
2017	2,291.7	46.8	2,240.7	2.1	2.1
2018	1,735.8	15.8	1,641.1	24.6	54.4
2019	983.2	13.1	932.8	13.3	23.9
2020	628.4	8.6	575.7	10.8	33.3
Projected 2028	2,506.0	105.7	2,394.1	3.2	3.0
Updated 2028 Projections	1,304	17	1,247	15	25

7.8.2.1. No. 7 Power Boiler (EU015)

WestRock Fernandina identified low-sulfur fuels, wet scrubber, and dry scrubber as potentially available controls for the No. 7 Power Boiler. Specifically, WestRock considered reducing coal usage to 125 tons per day, installing a wet scrubber after existing ESP, installing a DSI with existing ESP, or installing SDA with new fabric filter.

7.8.2.1.1. Estimated Costs of Compliance

Low-Sulfur Fuels - The estimated annual cost and cost effectiveness of reducing coal usage are based on operating data, current fuel costs (which vary based on the amount of gas consumed), and projected 2028 actual emissions. No capital is required to reduce coal usage for the No. 7 Power Boiler.

Wet Scrubber - The wet scrubber capital cost is based on the document titled “Emission Control Study – Technology Cost Estimates” by BE&K Engineering for AF&PA, September 2001 (BE&K Report). WestRock used cost estimates of installing a wet scrubber for SO_2 control on a coal/wood boiler produced 300,000 lb/hr of steam, and scaled equipment cost using an engineering cost scaling factor of 0.6 and the ratio of the No. 7 Power Boiler’s size to the size of the boiler evaluated in the BE&K report. The capital cost was scaled to 2019 dollars using the Chemical Engineering Plant Cost Index (CEPCI). Operating costs were estimated using the factors in the OAQPS Cost Manual, Section 5, Chapter 1. Mill-specific labor, chemical, and utility costs were used to estimate the annual cost of operating cost data. These equations are also included in the draft update to the OAQPS Control Cost Manual, Section 5, SO_2 and Acid Gas Controls. The cost of the wet scrubber option was analyzed with and without the cost of a stack liner.

DSI - The capital cost for a system to inject unmilled trona prior to the boiler’s ESP was estimated using a 2013 quote from Southern Environmental, Inc. (SEI) for an unmilled trona injection system, scaled to reflect the sorbent injection rate determined to be necessary to achieve 60% control during a trial. Operating costs are based on the trial injection rate and an April 2017 Sargent and Lundy report prepared under a U.S. EPA contract. Mill-specific labor, chemical, and utility costs were used to estimate the annual cost of operating.

SDA - The capital and operating costs for an SDA system, including a fabric filter, were estimated using a January 2017 Sargent and Lundy report prepared under a U.S. EPA contract and mill-specific cost data. These equations are also included in the draft update to the OAQPS Control Cost Manual, Section 5, SO_2 and Acid Gas Controls.

WestRock’s initial cost effectiveness values were:

- Reducing coal usage – $(1,868)/ton of SO_2 removed;
- Installing a wet scrubber – $6,681/ton of SO_2 removed;
- Installing a wet scrubber with stack liner – $7,311/ton of SO_2 removed;
- Installing DSI – $8,938/ton of SO_2 removed; and
- Installing an SDA – $18,652/ton of SO_2 removed.

The Department updated some parts of the analysis that were not justified adequately or were inconsistent with EPA's Cost Control Manual. In the control equipment calculations, WestRock used a 4.75% interest rate instead of 3.25% (the current bank prime interest rate), used a 15- or 20-year lifetime for equipment, and included property taxes without sufficient justification. These issues led to higher cost effectiveness values. The Department revised the cost effectiveness calculations. Table 7-32, Table 7-33, and Table 7-34 show the revised cost calculations for the FGD, DSI, and SDA options, respectively. The revised values are:

- Reducing coal usage – $(1,868)/ton of SO_2 removed;
- Installing a wet scrubber – $5,641/ton of SO_2 removed;
- Installing a wet scrubber with stack liner – $6,028/ton of SO_2 removed;
- Installing DSI – $8,776/ton of SO_2 removed; and
- Installing an SDA – $16,398/ton of SO_2 removed.

The Department has determined that reducing coal usage to 125 tons per day is cost effective and that installing add-on controls, such as a wet scrubber, DSI, or SDA are not cost effective. This conclusion is further supported by the fact that cost-effectiveness analysis did not consider the lowered future projected emissions after the unit reduces its coal usage and that the baseline emissions used in the analysis was conservative. The most recent emissions data shows that the two-year average from 2019 to 2020 was 754 tons per year considerably less that the 1,247 tons per year average used in the engineering analysis.

Table 7-32: WestRock No. 7 Power Boiler Final Revised Cost Effectiveness Analysis for FGD Options

Cost Items	Cost Factors	Cost - FGD	Cost - FGD with stack liner
DIRECT CAPITAL COSTS (DCC):		**$20,530,469**	**$25,333,069**
Total Purchased Equipment Costs (TEC):		$11,097,551	**$13,693,551**
Equipment Costs		$9,404,704	11604704.0
Instrumentation	10% of Equipment Costs	$940,470	$1,160,470
Sales Tax	3% of Equipment Costs	$282,141	$348,141
Freight	5% of Equipment Costs	$470,235	$580,235
Total Direct Installation Costs:		$9,432,918	$11,639,518
Foundations and Supports	12% of TEC	$1,331,706	$1,643,226
Handling and erection	40% of TEC	$4,439,020	$5,477,420
Electrical	1% of TEC	$110,976	$136,936
Piping	30% of TEC	$3,329,265	$4,108,065
Insulation for ductwork	1% of TEC	$110,976	$136,936
Painting	1% of TEC	$110,976	$136,936
INDIRECT CAPITAL COSTS (ICC)		**$3,884,143**	**$4,792,743**
Engineering	10% of TEC	$1,109,755	$1,369,355
Construction Management	10% of TEC	$1,109,755	$1,369,355
Contractor Fees	10% of TEC	$1,109,755	$1,369,355
Start-up	1% of TEC	$110,976	$136,936
Performance test	1% of TEC	$110,976	$136,936
Contingencies	3% of TEC	$332,927	$410,807
TOTAL CAPITAL INVESTMENT (TCI)	**DCC + ICC**	**$24,414,612**	**$30,125,812**
DIRECT ANNUAL COSTS		**$4,833,932**	**$4,833,932**
Operating Labor			
Operator		$21,079	$21,079
Supervisor	15% of operator labor	$3,162	$3,162
Maintenance			
Maintenance labor		$20,230	$20,230
Maintenance materials	100% of maintenance labor	$20,230	$20,230
Utilities			
Electricity		$2,054,915	$2,054,915
Chemicals		$2,636,410	$2,636,410
Fresh water usage		$70,824	$70,824
Wastewater disposal		$7,082	$7,082
INDIRECT ANNUAL COSTS		**$2,057,463**	$2,529,674
Overhead	60% of Labor and Material Costs	$38,821	$38,821
General and Administrative	2% of TCI	$488,292	$602,516
Insurance	1% of TCI	$244,146	$301,258
Capital recovery	CRF x TCI, 3.25% @ 30 years (CRF = 0.0527)	$1,286,204	$1,587,079
TOTAL ANNUAL COSTS	Direct + Indirect Annual Costs	**$6,891,395**	**$7,363,606**
Baseline emissions	tons of SO_2 per year	1247	1247
Emissions Reduction (98% control)	tons of SO_2 per year	1222	1222
COST EFFECTIVENESS, $/ton		**$5,641**	**$6,028**

Table 7-33: WestRock No. 7 Power Boiler Final Revised Cost Effectiveness Analysis for DSI Option

Cost Items	Designation	Calculation	Cost
Direct Costs			
Base Module	BM	Trona system base cost from SEI quote, scaled to increase size and injection rate based on trial with unmilled trona. Converted from 2013 dollars to 2019 dollars using the CEPCI.	$2,678,153
Indirect Costs			
Engineering and Construction			
Management	A1	10% BM	$267,815
Labor adjustment	A2	5% BM	$133,908
Contractor profit and fees	A3	5% BM	$133,908
Capital, engineering and construction cost subtotal	CECC	BM+A1+A2+A3	$3,213,784
Owner costs including all "home office" costs	B1	5% CECC	$160,689
Total project cost w/out AFUDC	TPC	B1+CECC	$3,374,473
AFUDC (0 for <1 year engineering and construction cycle)	B2	0% of (CECC+B1)	$0
Total Capital Investment (TCI)		CECC+B1+B2	**$3,374,473**
Fixed O&M Costs			
Additional operating labor costs	FOMO	(2 additional operator)*2080*Operating Labor Rate/(Unit Size*1000)	$1.79/MWh
Additional maintenance material and labor costs	FOMM	BM*0.01/(Unit Size*1000)	$0.3/MWh
Additional administrative labor costs	FOMA	0.03*(FOMO+0.4*FOMM)	$0.06/MWh
Total Fixed O&M Costs	FOM	FOMO+FOMM+FOMA	$2.14/MWh
		(FOM x Unit Size x 8760)	**$1,682,513**
Variable O&M Cost			
Costs for Sorbent	VOMR	Sorbent feed rate * Sorbent cost / Unit Size	$5.02/MWh
Costs for wate disposal that includes both sorbent and fly ash waste not removed prior to sorbent injection	VOMW	(Sorbent waste rate + Total fly ash waste rate) * Waste disposal cost / Unit size	$0.60/MWh
Additional aux power required	VOMP	Aux power * Aux power cost * 10	$0.24/MWh
Total Variable O&M Cost	VOM	VOMR + VOMW + VOMP	$5.86/MWh
		VOM * Unit size * 8760	**$4,602,214**
Indirect Annual Costs			
General and administrative		2% of TCI	$67,489
Insurance		1% of TCI	$33,745
Capital recovery		CRF x TCI, 3.25% @ 30 years (CRF = 0.0527)	$177,773
Total Indirect Annual Costs			**$279,007**
Total Annual Costs		Direct + Indirect Annual Costs	**$6,563,734**
Baseline emissions		tons of SO_2 per year	1247
Emissions Reduction (60% Control Efficiency)		tons of SO_2 per year	748
COST EFFECTIVENESS		**$/ton**	**$8,776**

Table 7-34: WestRock No. 7 Power Boiler Final Revised Cost Effectiveness Analysis for SDA Option

Cost Items	Designation	Calculation	Cost
Direct Costs			
Base module absorber island cost (includes baghouse)	BMR		$16,794,357
Base module reagent prep/waste handling cost	BMF		$6,926,637
Base module balance of plant costs	BMB		$23,683,320
Total Base Module Costs	BM		**$47,404,314**
Indirect Costs			
Engineering and Construction			
Management	A1	10% BM	$4,740,431
Labor adjustment	A2	10% BM	$4,740,431
Contractor profit and fees	A3	10% BM	$4,740,431
Capital, engineering and construction cost subtotal	CECC	BM+A1+A2+A3	$61,625,608
Owner costs including all "home office" costs	B1	5% CECC	$3,081,280
Total project cost w/out AFUDC	TPC	B1+CECC	$64,706,889
AFUDC (0 for <1 year engineering and construction cycle)	B2	15% of TPC	$9,706,033
Total Project Cost	TCI	CECC+B1+B2	**$74,412,922**
Fixed O&M Costs			
Additional operating labor costs	FOMO	(8 additional operators)*2080*Operating Labor Rate/(Unit Size*1000)	$7.14/MWh
Additional maintenance material and labor costs	FOMM	BM*0.015/(Unit Size*1000)	$7.93/MWh
Additional administrative labor costs	FOMA	0.03*(FOMO+0.4*FOMM)	$0.31/MWh
Total Fixed O&M Costs	FOM	FOMO+FOMM+FOMA	$15.38/MWh
		(FOM x Unit Size x 8760)	**$12,084,041**
Variable O&M Cost			
Costs for lime reagent	VOMR	Design lime rate * Lime cost / Unit size	$0.48/MWh
Costs for waste disposal	VOMW	Design waste rate * Waste disposal cost / Unit size	$0.12/MWh
Additional aux power required	VOMP	Aux power * Aux power cost * 10	$0.89/MWh
Costs for makeup water	WOMM	Makeup water rate * Makeup water cost / Unit size	$0.02/MWh
Total Variable O&M Cost	VOM	VOMR + VOMW + VOMP + WOMM	$1.51/MWh
		VOM * Unit size * 8760	**$1,183,075**
Indirect Annual Costs			
General and administrative		2% of TCI	$1,488,258
Insurance		1% of TCI	$744,129
Capital recovery		CRF x TCI, 3.25% @ 30 years (CRF = 0.0527)	$3,920,200
Total Indirect Annual Costs			**$6,152,588**
Total Annual Costs		Direct + Indirect Annual Costs	**$19,419,704**
Baseline emissions		tons of SO_2 per year	1247
Emissions Reduction (95% Control Efficiency)		tons of SO_2 per year	1184
COST EFFECTIVENESS		**$/ton**	**$16,398**

7.8.2.1.2. Time Necessary for Compliance

WestRock would need a minimum of four years to install a wet scrubber, a DSI, or an SDA system. This would include securing funding, the design, permitting, procurement, installation, and shakedown of the emission control.

WestRock indicated they would need until 2024 to fully implement the coal reduction option, but could begin limiting coal as early as 2022, because the Mill is contractually obligated to purchase a set amount of coal through 2021. Specifically, construction and operation of the Amelia Island Energy, LLC (AIE) facility will enable the mill to reduce steam production from its existing boilers. WestRock is coordinating the reduction of its coal use with the startup of the new AIE cogeneration facility. WestRock believes that it could implement the coal reductions to synchronize with the startup of the AIE facility by April 2024.

7.8.2.1.3. Energy and Non-Air Quality Impacts of Compliance

WestRock identified no significant energy or non-air related impacts for reducing coal. Installation of a wet scrubber would increase water and electricity usage and wastewater generation. Installation of a DSI system or an SDA system would increase solid waste and electricity usage. The No. 7 Power Boiler fly ash is currently used in cement manufacturing but would have to be landfilled if contaminated with sorbent.

7.8.2.1.4. Remaining Useful Life

The No. 7 Power Boiler is assumed to have a remaining useful life of twenty years or more. For installing a wet scrubber, DSI, or SDA system, the Mill used the remaining useful life of the control, which was estimated to be 15 years for the wet scrubber and 20 years for a DSI or SDA system. However, the Department conservatively used a remaining useful life of 30 years to annualize costs.

7.8.2.1.5. Summary of Findings for WestRock Fernandina Beach No. 7 Power Boiler (EU015)

The primary factor that the Department used to determine whether a control or measure is necessary for reasonable progress was the cost of compliance. The Department then further considered the other three factors (time necessary for compliance, energy and non-air quality impacts, and remaining useful life). In some cases, the other factors are already considered in the costs, such as remaining useful life through annualizing the costs of compliance, or energy and non-air quality impacts being considered in costs such as increased water and electricity usage.

For the No. 7 Power Boiler, the Department does not consider installing a wet scrubber, installing DSI, or installing SDA to be cost-effective, especially if the unit reduces coal usage and therefore reduces SO_2; therefore, these options are not necessary for reasonable progress. The Department has determined that reducing coal usage to 125 tons per day is cost-effective. Given that WestRock can timely implement the coal usage reduction and there are no energy or non-air environmental impacts, the Department has determined that reducing coal usage is necessary for reasonable progress.

WestRock indicated that it needs about four years to complete the changes necessary to reduce coal usage to 125 tons per day. The Department, however, will impose a coal consumption limit effective January 1, 2022, to reflect more recent actual operation. Specifically, the Department will require through Permit No. 0890003-072-AC the following requirements:

- Coal Usage Cap No. 1: Effective on January 1, 2022, coal usage for the No. 7 Power Boiler shall not exceed 250 tons per day (TPD) based on a 30-day rolling average. The 250 TPD, 30-day rolling average coal cap excludes days on which a natural gas curtailment or supply interruption occurs as defined in 40 CFR 63, Subpart DDDDD.
- Coal Usage Cap No. 2: Effective on April 1, 2024, coal usage for the No. 7 Power Boiler shall not exceed 125 TPD based on a 30-day rolling average. The 125 TPD, 30-day rolling average coal cap excludes days on which a natural gas curtailment or supply interruption occurs.
- Notification of Gas Curtailment Events: The permittee shall notify the Permitting Authority within 5 business days of the start and end of any gas curtailment or supply interruption event and keep records onsite for a period of 5 years documenting each gas curtailment event.

These requirements will be included as part of Florida's Regional Haze SIP. The Department will also include in the supplemental SIP updated permit conditions for WestRock Fernandina Beach that include monitoring, reporting, and recordkeeping requirements for the No. 7 Power Boiler.

7.8.2.2. No. 5 Power Boiler (EU006)

WestRock Fernandina identified installation of a wet scrubber or installation of a DSI system as available controls for the No. 5 Power Boiler. The No. 5 Power Boiler already fires only low-sulfur fuels (biomass, natural gas, and ULSD).

7.8.2.2.1. Estimated Costs of Compliance

WestRock used the same methodology to estimate costs for installing a wet scrubber or a DSI on the No. 5 Power Boiler that was used for the No. 7 Power Boiler (Section 7.8.4.1.1).

WestRock's initial cost effectiveness values were:

- Installing a wet scrubber - $344,472/ton of SO_2 removed;
- Installing a wet scrubber with stack liner - $365,464/ton of SO_2 removed; and
- Installing DSI – $284,922/ton of SO_2 removed.

The Department updated some parts of the analysis that were not justified adequately or were inconsistent with EPA's Cost Control Manual. These issues are using a 4.75% interest rate instead of 3.25% (the current bank prime interest rate), using a 15 or 20-year lifetime for equipment, and including property taxes without justification. These issues led to higher cost effectiveness values. The Department revised the cost effectiveness calculations; however, the revised calculations are not shown because the updated costs remain an order of magnitude above a reasonable cost-effectiveness threshold. The revised values are:

- Installing a wet scrubber - \$285,615/ton of SO_2 removed;
- Installing a wet scrubber with stack liner - \$298,499/ton of SO_2 removed; and
- Installing DSI – \$277,093/ton of SO_2 removed.

The Department has determined that these control options are not cost effective.

7.8.2.2.2. Time Necessary for Compliance

WestRock would need a minimum of four years to install a wet scrubber or a DSI system. This would include securing funding, the design, permitting, procurement, installation, and shakedown of the emission control.

7.8.2.2.3. Energy and Non-Air Quality Impacts of Compliance

Installation of a wet scrubber would increase water and electricity usage and wastewater generation. Installation of a DSI system or an SDA system would increase solid waste (including landfilling the No. 5 Power Boiler fly ash contaminated with sorbent) and electricity usage.

7.8.2.2.4. Remaining Useful Life

The No. 5 Power Boiler is assumed to have a remaining useful life of twenty years or more. For installing a wet scrubber, DSI, or SDA system, the Mill used the remaining useful life of the control, which was estimated to be 15 years for the wet scrubber and 20 years for a DSI system. However, the Department conservatively used a lifetime of 30 years to annualize costs.

7.8.2.2.5. Summary of Findings for WestRock Fernandina Beach No. 5 Power Boiler (EU006)

The primary factor that the Department used to determine whether a control or measure is necessary for reasonable progress was the cost of compliance. The Department then further considered the other three factors (time necessary for compliance, energy and non-air quality impacts, and remaining useful life). Remaining useful life in this case is already considered in the costs factor through annualizing the costs of compliance. For the No. 5 Power Boiler, the Department does not consider installing a wet scrubber or DSI system to be cost-effective and therefore, has determined that these controls are not necessary for reasonable progress.

7.8.2.3. Nos. 4 and 5 Recovery Boilers (EU007, EU011)

WestRock Fernandina identified installation of a wet scrubber as an available control for the Nos. 4 and 5 Recovery Boilers.

7.8.2.3.1. Estimated Costs of Compliance

WestRock used the same methodology to estimate costs of installation of a wet scrubber on the recovery boilers as was used for the two power boilers, except the analysis was based on an NDCE recovery boiler burning 3.7 million pounds of BLS per day from the BE&K Report. WestRock scaled the equipment cost using an engineering cost scaling factor of 0.6 and the ratio of each recovery boiler's throughput to the throughput of the boiler evaluated in the BE&K Report. The capital cost was scaled to 2019 dollars using the Chemical Engineering Plant Cost Index (CEPCI). Operating costs were estimated using the factors in the OAQPS Cost Manual, Section 5, Chapter 1.

WestRock's initial cost effectiveness values for installing a wet scrubber were:

- No. 4 Recovery Boiler - $378,013/ton of SO_2 removed;
- No. 5 Recovery Boiler - $226,808/ton of SO_2 removed;

The Department updated some parts of the analysis that were not justified adequately or were inconsistent with EPA's Cost Control Manual. WestRock used a 4.75% interest rate instead of 3.25% (the current bank prime interest rate), used a 15-year lifetime for equipment, and included property taxes without sufficient justification. These issues led to higher cost effectiveness values. The Department revised the cost effectiveness calculations; however, the revised calculations are not shown because the updated costs remain an order of magnitude above a reasonable cost-effectiveness threshold. The revised values are:

- No. 4 Recovery Boiler - $282,375/ton of SO_2 removed;
- No. 5 Recovery Boiler - $169,425/ton of SO_2 removed;

7.8.2.3.2. Time Necessary for Compliance

WestRock would need a minimum of four years to install a wet scrubber. This would include securing funding, the design, permitting, procurement, installation, and shakedown of the emission control.

7.8.2.3.3. Energy and Non-Air Quality Impacts of Compliance

Installation of a wet scrubber would increase water and electricity usage and wastewater generation. Additional electricity would be needed to run a wet scrubber and additional fan power would be required to overcome the additional pressure drop through a new wet scrubber.

7.8.2.3.4. Remaining Useful Life

The No. 4 and No. 5 Recovery Boilers are assumed to have a remaining useful life of twenty years or more. For installing a wet scrubber, the Mill used the remaining useful life of the control, which was estimated to be 15 years.

7.8.2.3.5. Summary of Findings for WestRock Fernandina Beach Nos. 4 and 5 Recovery Boilers (EU007 and EU011)

The primary factor that the Department used to determine whether a control or measure is necessary for reasonable progress was the cost of compliance. The Department then further considered the other three factors (time necessary for compliance, energy and non-air quality impacts, and remaining useful life). Remaining useful life in this case is already considered in the costs factor through annualizing the costs of compliance. For the Nos. 4 and 5 Recovery Boilers, the Department does not consider installing an FGD system to be cost-effective and therefore, the Department determined that these controls are not necessary for reasonable progress.

7.8.3. Foley Mill Four-Factor Analysis

The Georgia-Pacific, Foley Cellulose, LLC, Foley Mill is a softwood Kraft Process Pulp Mill that manufactures bleached market pulps and dissolving cellulose pulps. The Department requested that the facility complete an analysis for six units expected to emit more than 5 tpy of SO_2 in 2028.

The No. 1 Power Boiler (EU 002) was built by Babcock and Wilcox in 1953. The boiler fires natural gas, No. 6 fuel oil, tall oil, and on-specification used oil. The No. 1 Power Boiler serves as the secondary control device for low volume, high concentration (LVHC) NCGs up to 2,800 hours per year. The NCGs are routed to the total reduced sulfur (TRS) pre-scrubber before introduction to the boiler. The No. 1 Power Boiler is capable of serving the Mill with 195,000 pounds per hour (lbs/hr) of steam. The majority of annual SO_2 emissions from the boiler are due to combustion of the NCGs, converting reduced sulfur compounds to SO_2 and water. When NCGs are routed to the No. 1 Power Boiler, a pre-scrubber is used to assist with reduction of TRS which in turn limits SO_2 production.

The No. 1 Bark Boiler (EU 004) fires carbonaceous fuel, consisting of wood materials such as bark, chips, and sawdust; No. 6 fuel oil; natural gas; tall oil; and on-specification used oil. The boiler serves as the primary control device for LVHC NCGs. The No. 1 Bark Boiler is capable of serving the Mill with 200,000 lbs/hr (24-hour block average basis) of steam and is equipped with a cyclone collector and a wet venturi scrubber.

The No. 2 Bark Boiler (EU 019) fires carbonaceous fuel consisting, of wood materials such as bark, chips, and sawdust; No. 6 fuel oil; natural gas; tall oil; and on-specification used oil. The boiler is capable of serving the Mill with 395,000 lbs/hr (24-hour block average basis) of steam. The flue gases from the No. 2 Bark Boiler are split into two streams: (1) one stream flowing through the economizer to a wet, Venturi scrubber, through the demister, and out the stack and (2) the other stream bypassing the economizer and going directly to a cyclone collector and a second wet, Venturi scrubber.

The Mill's three recovery furnaces (EUs 006, 007, and 011) are nondirect contact evaporator (NDCE) units and burn the organic material present in black liquor (black liquor solids, BLS). In addition to BLS, the Nos. 2, 3, and 4 Recovery Furnaces may also be fired with natural gas, No. 6 fuel oil, No. 2 fuel oil, tall oil, ultra-low sulfur diesel, on-specification used oil, and methanol (only in the Nos. 2 and 4 Recovery Furnaces). Particulate matter emissions from the recovery furnaces are controlled by dedicated electrostatic precipitators (ESPs).

Table 7-35 shows the most recent SO_2 emissions from each of these units, excluding de minimis units emitting less than 5 tpy. The Department required a four-factor analysis for each unit except for the No. 2 Bark Boiler (EU019). Based on recent emissions data and operational plans going forward, the Foley Mill does not expect this unit to emit more than five tpy of SO_2 in the future. SO_2 emissions from the No. 2 Bark Boiler are primarily from the firing of No. 6 fuel oil, which is only fired when there are issues with the natural gas line header pressure. The Mill does not expect to alter the current fuel mix going forward. Foley Mill used the 2017-2019 three-year average emissions in the four factor analyses.

Table 7-35: SO_2 Emissions (tpy) from units at Foley Mill (12123-752411)

Year	Total	No. 1 PB - EU002	No. 1 BB - EU004	No. 2 RF - EU006	No. 3 RF - EU007	No. 4 RF - EU011
2011	1,517.0	22.1	716.9	64.5	410.9	302.6
2012	1,575.0	15.2	730.9	197.1	421.5	210.3
2013	2,066.0	23.7	728.8	193.7	878.3	241.5
2014	1,925.7	32.1	902.2	164.5	497.6	329.3
2015	2,544.8	52.5	863.6	285.2	806.5	537.0
2016	2,634.4	105.9	677.1	369.3	665.7	816.4
2017	1,531.0	60.2	192.4	328.0	422.7	527.7
2018	1,711.1	114.0	175.8	248.5	493.5	679.3
2019	2,059.7	69.8	195.3	344.2	803.2	647.2
2020*	2,080.6	29.3	155.2	224.4	1,030.4	641.3
Projected 2028	1,425.4	0	708.5	34.2	386.2	296.5

*Preliminary

The Department is still in the process of reviewing the four factor analyses that Foley Mill completed for the No. 1 Power Boiler (EU002), the No. 1 Bark Boiler (EU004), and the Nos. 2, 3, and 4 Recovery Furnaces (EU006, EU007, and EU011). The Department will supplement this SIP with a determination of whether any controls or measures are necessary for reasonable progress and include any permit conditions, as necessary, when the Department's review is complete.

7.8.4. WestRock Panama City Four-Factor Analysis

WestRock CP, LLC Panama City Mill is a Kraft pulp and paper production facility in Panama City, Florida. Wood is ground into chips and digested in a caustic solution to break down the lignin binding the cellulosic wood fibers. The wood fibers are washed, bleached and formed into paper or linerboard. Panama City Mill is comprised of major activities areas such as: wood handling, pulping, bleaching, chemical recovery, powerhouse, paper machines, and associated processes and equipment.

In the Kraft process, the digesting liquor (white liquor) is a solution of sodium hydroxide and sodium sulfide that is mixed with wood chips and cooked under pressure. The spent liquor, known as weak black liquor, is concentrated and sodium sulfate is added to make up for chemical losses. The black liquor solids (BLS) are burned in the recovery furnaces to produce a smelt of sodium carbonate and sodium sulfide. The smelt is dissolved in water to form green liquor to which quicklime (calcium oxide) is added to convert the sodium carbonate back to sodium hydroxide, which reconstitutes the cooking liquor. The spent lime cake (calcium carbonate) is recalcined in a rotary lime kiln to produce quicklime, which is used to convert the green liquor to cooking liquor. Steam and energy needed at the plant are met by the combination boilers, which burn bark/wood, secondary solids (residuals) from the aerated stabilization basin, natural gas, No. 2 fuel oil, No. 6 fuel oil, and one of the combination boilers fires coal. The significant sources of SO_2 at the mill are the No. 3 and No. 4 Combination Boilers (EU015 and EU016) and the No. 1 and No. 2 Recovery Boilers (EU001 and EU019).

The No. 3 and No. 4 combination boilers burn wood, bark, primary clarified wood fibers, secondary solids (residuals) from the aerated stabilization basin, natural gas, No. 2 fuel oil, and No. 6 fuel oil. Off-gases from the condensate stripper are transported to the No. 3 boiler for thermal destruction of TRS, HAP and VOC. The No. 4 Combination boiler serves as a backup control devise for this purpose. Both No. 3 and No. 4 combination boilers serve as a backup control device to the lime kiln for the NCG from the Multiple Effect Evaporator (MEE) System and from the batch digester system. SO_2 emissions from each boiler are continuously monitored by a CEMS.

The No. 1 and No. 2 recovery boilers are direct contact evaporator recovery boilers that fire BLS, natural gas, No. 2 fuel oil, and No. 6 fuel oil. Each boiler is equipped with two induced draft fans and an electrostatic precipitator (ESP) to control emission of PM. TRS emissions are reduced by a two-stage heavy black liquor oxidation system. Each stack is equipped with a continuous emissions monitoring system (CEMS) to continuously monitor TRS and a continuous opacity monitoring system (COMS) to continuously measure opacity. High-Volume Low-Concentration (HVLC) NCGs from the No. 1 Brown Stock Washer System (BSWS) are collected and destroyed in either of the recovery boilers.

Table 7-36 shows the most recent SO_2 emissions from each of these units, excluding de minimis units emitting less than 5 tpy. The original projected emissions are significantly higher than recent actual emissions because projections were based on the 2011 base year emissions. 2017 emissions better reflect how the facility has generally operated since 2012 and better represents actual emissions expected in 2028. Therefore, the cost-effectiveness analyses were based on 2017 emissions which are a reasonable estimate for 2028 actual operation and emissions.

Table 7-36: SO_2 emissions (tpy) from units at WestRock Panama City Mill

Year	Total	No. 1 RB – EU001	No. 3 CB – EU015	No. 4 CB – EU016	No. 2 RB – EU019
2011	2,378.9	592.7	37.9	1,167.0	581.3
2012	908.8	63.3	36.7	711.2	97.6
2013	1,032.0	73.5	132.9	759.6	66
2014	1,461.1	108.2	602.8	666.1	84
2015	983.2	129.3	264.2	517.3	72.4
2016	1,004.7	108.7	198.5	621.8	75.7
2017	1,010.5	166.9	198.8	570.5	74.3
2018	660.6	110.3	172.4	297.3	80.6
2019	457.8	79.5	151.9	125.9	100.5
2020	1,114.5	168.6	176.9	672.6	96.4
Projected 2028	2,577.9	562.4	1.1	1,458.8	555.6

The Department is still in the process of reviewing the four factor analyses that WestRock Panama City completed for the No. 1 Recovery Boiler (EU001), the No. 2 Recovery Boiler (EU019), the No. 3 Combination Boiler (EU015), and the No. 4 Combination Boiler (EU016). The Department will supplement this SIP with a determination of whether any controls or measures are necessary for reasonable progress and include any permit conditions, as necessary, when the Department’s review is complete.

7.9. Consideration of Five Additional Factors

Section 51.308(f)(2)(iv) of the Regional Haze Rule requires that states must consider five additional factors when developing a long-term strategy. These five additional factors are:

A. Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment;

B. Measures to mitigate the impacts of construction activities;

C. Source retirement and replacement schedules;

D. Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs; and

E. The anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy.

Factors B and D are addressed below in Section 7.9.2 and Section 7.9.1, respectively.

Factor A and Factor C are addressed in other sections of this document. For Factor A, the emission reductions from ongoing air pollution control programs, including, where applicable, measures to address reasonably attributable visibility impairment, are included in the baseline and 2028 emission inventories discussed in Section 4. For Factor C, specific existing and planned emission controls are explained in Section 7.2.

For Factor E, the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy is reflected in the reasonable progress goals discussion located in Section 8.

7.9.1. Smoke Management

Florida has a certified Smoke Management Plan (SMP) meeting the intent of EPA's Interim Air Quality Policy on Wildland and Prescribed Fires. The EPA, Region 4, acknowledged receipt of the original SMP and its certification in February 2002.

Florida most recently updated the SMP in 2013, and EPA, Region 4 acknowledged receipt of the updated SMP and its certification in January 2014. The SMP follows the requirements for such a plan contained in the Interim Air Quality Policy on Wildland and Prescribed Fires. The Florida Forest Service operates a burn authorization program that considers the potential for smoke from the burn impacting smoke sensitive receptors (e.g., airports, roads, hospitals, urban areas, etc.). The SMP provides alternatives for burning and is considerate of minimizing air pollutants. The updated SMP ensures that the plan supports Florida maintaining the NAAQS and remains in compliance with EPA rules (e.g. the Exceptional Events Rule and the Regional Haze Rule). The updated SMP is located in Appendix G-4. Appendix G-4 is included for reference only and should not be adopted as part of the SIP.

7.9.2. Dust and Fine Soil from Construction Activities

As discussed in Section 2.4.2 and demonstrated in Figure 2-1, fine soils were a relatively minor contributor to visibility impairment at the Class I areas in Florida during the baseline period of 2000-2004. Figure 2-2 and Figure 2-3 show that no VISTAS Class I areas experienced significant visibility impairment from soils during this timeframe. Figure 2-7 shows that fine soils continue to be only a minor contributor to visibility at the Class I areas in Florida during the most current period of monitoring data (2014-2018). Figure 2-8 and Figure 2-9 show that no VISTAS Class I areas experienced significant visibility impairment from soils during the 2014-2018 timeframe.

With regard to the impact of construction activities, Rule 62-296.320, F.A.C., General Pollutant Emission Limiting Standards addresses construction related activities. In particular, section (4)(c) Unconfined Emissions of Particulate Matter provides that reasonable precautions be taken to prevent or eliminate emissions. For example, the rule addresses paving and maintenance of roads, parking areas, and yards and the application of water or chemicals to control emissions during construction.

7.10. Florida's Long-Term Strategy for the Second Implementation Period

Pursuant to 40 CFR 51.308(f)(2), Florida's long-term strategy includes the enforceable emissions limitations and compliance schedules established for the six facilities described in Section 7.6.4.1 for effectively-controlled units and Section 7.8 for units that completed the four-factor analysis. These enforceable emissions limitations and compliance schedules also satisfied the requirement to address sources that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area located in another State or States, and represent the coordinated emission management strategies between Florida and Georgia.

Florida's long-term strategy also includes requests to other states to address emission sources that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area in Florida, as discussed in Section 10.1. Florida's participation in the VISTAS regional planning process and separate interstate consultation process has ensured that Florida will achieve its apportionment of emission reduction obligations from other VISTAS states. Florida is awaiting the results of Georgia's and Kentucky's reasonable progress analyses.

As discussed in Section 7.2.2, the development of Florida's long-term strategy has relied on technical analyses developed by the regional planning organization and EPA. These technical analyses included a review of all anthropogenic sources of visibility impairment, which included major and minor stationary sources, mobile sources, and area sources. As discussed in Section 7.4, the results of these analyses led Florida's long-term strategy to focus on point sources of SO_2 in the source selection process.

In addition to the requirements of the long-term strategy discussed above, Florida also considered the following factors in developing its long-term strategy:

- As discussed in Section 7.2.1, Florida considered the effect of emission reductions due to ongoing air pollution control programs.
- As discussed in Section 7.9.2, Florida considered the effect of measures to mitigate the impacts of construction activities.
- As discussed in Section 8.2.2, Florida considered the effect of source retirements and replacement schedules.
- As discussed in Section 7.9.1, Florida considered the effect of basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs
- As discussed in Section 7.2, Florida considered the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions expected through 2028.

In summary, Florida's long-term strategy includes: (1) the specific enforceable emissions limitations and measures resulting from the effective controls analyses summarized in Section 7.6.4.1 and those resulting from the four-factor analyses summarized in Section 7.8, which have been proposed to be incorporated into the regulatory portion of Florida's SIP; (2) consideration of Florida's impact to Class I areas in other states; (3) consulting with states regarding out-of-state emission reductions needed to reduce visibility impairment at Florida's Class I areas; and (4) consideration of additional factors as discussed above.

8. Reasonable Progress Goals

The rule at 40 CFR 51.308(f)(3) requires states to establish RPGs in units of dv for each Class I area within the state that reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period (2028), as a result of those enforceable emissions limitations, compliance schedules, and other measures required that can be fully implemented by the end of the applicable implementation period (2028), as well as the implementation of other requirements of the CAA. The long-term strategy and the RPGs must provide for an improvement in visibility for the most impaired days since the baseline period and ensure no degradation in visibility for the clearest days since the baseline period.

If a state in which a mandatory federal Class I area is located establishes an RPG for the most impaired days that provides for a slower rate of improvement in visibility than the URP, the state must demonstrate, based on the analysis required by 40 CFR 51.308(f)(2)(i), that there are no additional emission reduction measures for anthropogenic sources in the state that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the long-term strategy. (See 40 CFR 51.308(f)(3)(ii)(A) for additional requirements.)

Further, if a state contains sources that are reasonably anticipated to contribute to visibility impairment in a mandatory federal Class I area in another state for which that state has established an RPG that provides for slower rate of improvement in visibility than the URP, the state must demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the state that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in its own long-term strategy. (See 40 CFR 51.308(f)(3)(ii)(B).)

It is notable that the RPGs established in this SIP are not directly enforceable, but the RPGs can be used to evaluate whether the SIP is adequately providing reasonable progress towards achieving natural visibility. (See 40 CFR 51.308(f)(3)(iii).)

8.1. RPGs for Class I Areas within Florida

Therefore, in accordance with the requirements of 40 CFR 51.308(f)(3), this regional haze SIP establishes RPGs for Chassahowitzka, St. Marks, and Everglades. To calculate the rate of progress represented by each goal, Florida compared baseline visibility conditions (2000 to 2004) to natural visibility conditions in 2064 at each Class I area and determined the uniform rate of visibility improvement (in dv) that would need to be maintained during each implementation period in order to attain natural visibility conditions by 2064. Through the VISTAS and EPA modeling, Florida estimated the expected visibility improvements by 2028 in Florida Class I area resulting from existing federal and state regulations expected to be implemented and facility closures expected to occur by 2028 in Florida and neighboring states. The VISTAS baseline modeling demonstrated that the 2028 base case control scenario provides for an improvement in visibility below the URP for each Class I area for the 20% most impaired days and ensures no degradation in visibility for the 20% clearest days over the 2000 to 2004 baseline period for Chassahowitzka and St. Marks, and the EPA modeling shows the same for Everglades. These controls and facility closures, to the extent known and quantifiable, were included in the modeling. The results of this modeling are shown in Section 7.2.6.

As detailed in Section 7.6, 13 facilities in Florida were identified for reasonable progress analysis. Eleven facilities are located in Florida and two facilities are located in Georgia. The RPGs do not include reductions resulting from four-factor reasonable progress analyses or recently announced retirements and fuel switches. Florida is not adjusting the RPGs to account for these reductions; therefore, the RPGs are a conservative estimate of 2028 visibility projections.

Table 8-1 provides the RPGs for Florida’s Class I areas, along with the baseline visibility, the Uniform Rates of Progress for 2028, and natural visibility conditions. The numbers in brackets contain the projected improvement from the baseline, the amount of improvement from the baseline needed to meet the 2028 Uniform Rate of Progress, and the additional improvement needed to achieve natural conditions, respectively. Table 8-2 provides the expected visibility in 2028 on 20% clearest days as compared to the 2000-2004 baseline 20% clearest day values. This table shows that projected visibility on the 20% clearest days will not degrade but rather will improve significantly by 2028. The number in brackets indicates the projected improvement from baseline conditions.

Table 8-1: Florida RPGs – 20% Most Impaired Days

Class I Area	**2000-2004 Baseline Visibility (dv)[(1)]**	**2028 Reasonable Progress Goals* (dv)** [2004 – 2028 decrease, (dv)]	**2028 Uniform Rate of Progress (dv)** [2004 – 2028 decrease to meet uniform progress, (dv)]	**Natural Visibility (dv)** [2028 – 2064 decrease needed from 2028 goal]
Chassahowitzka	24.62	16.79 [7.83]	18.36 [6.26]	8.97 [7.82]
St. Marks	24.30	16.43 [7.87]	18.26 [6.04]	9.19 [7.24]
Everglades	19.54	13.95** [5.59]	15.06 [4.48]	8.34 [7.18]

[(1)] The 2000-2004 baseline visibility data reflect values included in Table 1 in the EPA memorandum with subject: Technical addendum including updated visibility data through 2018 for the memo titled, "Recommendation for the use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program."[56]

*RPGs do not yet include reductions resulting from four-factor reasonable progress analyses or recently announced retirements. The RPGs will be updated in the formal SIP submission to account for these reductions to the greatest amount practicable.

**As discussed in Section 6.6, Florida is relying on EPA's modeling projections for Everglades.

Table 8-2: Florida Class I Area 20% Clearest Day Comparisons

Class I Area	**2000-2004 Baseline Visibility (dv)[(1)]**	**2028 Reasonable Progress Goal (dv)** [2004 – 2028 improvement goal]
Chassahowitzka	15.49	12.54 [2.95]
St. Marks	14.31	11.59 [2.72]
Everglades	11.69	9.88* [1.81]

[(1)] The 2000-2004 baseline visibility data reflect values included in Table 1 in the EPA memorandum with subject: Technical addendum including updated visibility data through 2018 for the memo titled, "Recommendation for the use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program."[57]

*As discussed in Section 6.6, Florida is relying on EPA's modeling projections for Everglades.

Florida has determined that the RPGs will be more stringent than the expected glide path prediction for Chassahowitzka, St. Marks, and Everglades. In addition, there are no sources in Florida that are reasonably anticipated to contribute to visibility impairment in a Class I area in another state for which an RPG has been established that is slower than the URP.

[56] URL: https://www.epa.gov/sites/production/files/2020-06/documents/memo_data_for_regional_haze_technical_addendum.pdf

[57] URL: https://www.epa.gov/sites/production/files/2020-06/documents/memo_data_for_regional_haze_technical_addendum.pdf

8.2. Reductions Not Included in the 2028 RPG Analysis

Additional reductions in visibility impairing pollutants have occurred since VISTAS conducted the modeling analyses for the 2028 RPGs. These reductions, described below, will help to ensure that the Florida Class I areas will meet these projected RPGs and that additional visibility improvement is likely.

8.2.1. Out of State Reasonable Progress Evaluation Reductions

Table 7-26 provides the listing of facilities that were estimated to impact Florida's Class I areas that are located outside of Florida. As required by the RHR, Florida notified these states of the findings of significant contribution and asked those states for information regarding the results of the reasonable progress evaluations performed at those facilities. Section 10.1 will provide a description of each response. If any reasonable progress controls or measures result from these out of state reasonable progress analyses, the resulting emission reductions will help ensure that the RPGs provided in Table 8-1 are met for 20% most impaired days and that no visibility degradation on the 20% clearest days occurs.

8.2.2. Unit Retirements or Fuel Switches

The following facilities have announced unit retirements or fuel switches that are not accounted for in the 2028 emissions inventory or RPGs, and therefore further ensure that visibility improvements will meet or be better than the RPGs:

- Lakeland CD McIntosh Power Plant – At the time VISTAS put together the 2028 emissions inventory, there were no plans to shut down the coal unit at this facility. However, the coal-fired steam generator Unit 3 (EU006) was permanently shutdown in 2021.
- Gainesville Regional Utilities has received permits allowing for up to 100% natural gas firing in its Deerhaven Unit 2. This EGU will have the ability to fire all gas, all coal, or a combination thereof.
- OUC Stanton has announced that it will end coal-firing by the end of 2027, and the units are already co-firing natural gas.

9. Monitoring Strategy

The SIP is to be accompanied by a strategy for monitoring regional haze visibility impairment. Specifically, the Rule states at 40 CFR 51.308(f)(6):

> (6) The State must submit with the implementation plan a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all mandatory Class I Federal areas within the State. Compliance with this requirement may be met through participation in the Interagency Monitoring of Protected Visual Environments network. The implementation plan must also provide for the following:
>
> > (i) The establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals to address regional haze for all mandatory Class I Federal areas within the State are being achieved.
> >
> > (ii) Procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas both within and outside the State.
> >
> > (iii) For a State with no mandatory Class I Federal areas, procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas in other States.
> >
> > (iv) The implementation plan must provide for the reporting of all visibility monitoring data to the Administrator at least annually for each mandatory Class I Federal area in the State. To the extent possible, the State should report visibility monitoring data electronically.
> >
> > (v) A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Federal area. The inventory must include emissions for the most recent year for which data are available, and estimates of future projected emissions. The State must also include a commitment to update the inventory periodically.

(vi) Other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.

Such monitoring is intended to provide the data needed to satisfy four objectives:

- Track the expected visibility improvements resulting from emissions reductions identified in this SIP.
- Better understand the atmospheric processes of importance to haze.
- Identify chemical species in ambient particulate matter and relate them to emissions from sources.
- Evaluate regional air quality models for haze and construct RRFs for using those models.

The primary monitoring network for regional haze, both nationwide and in Florida, is the IMPROVE network. Given that IMPROVE monitoring data from 2000-2004 serves as the baseline for the regional haze program, the future regional haze monitoring strategy must necessarily be based on, or directly comparable to, IMPROVE. The IMPROVE measurements provide the only long-term record available for tracking visibility improvement or degradation, and, therefore, Florida intends to rely on the IMPROVE network for complying with the regional haze monitoring requirement in the rule.

As shown in Table 9-1 and Figure 9-1, there are currently three IMPROVE sites in the state, at Chassahowitzka, St. Marks, and Everglades.

Table 9-1: Florida Class I Areas and Representative IMPROVE Monitors

Class I Area	IMPROVE Site Designation
Chassahowitzka Wilderness Area	CHAS1
St. Marks Wilderness Area	SAMA1
Everglades National Park	EVER1

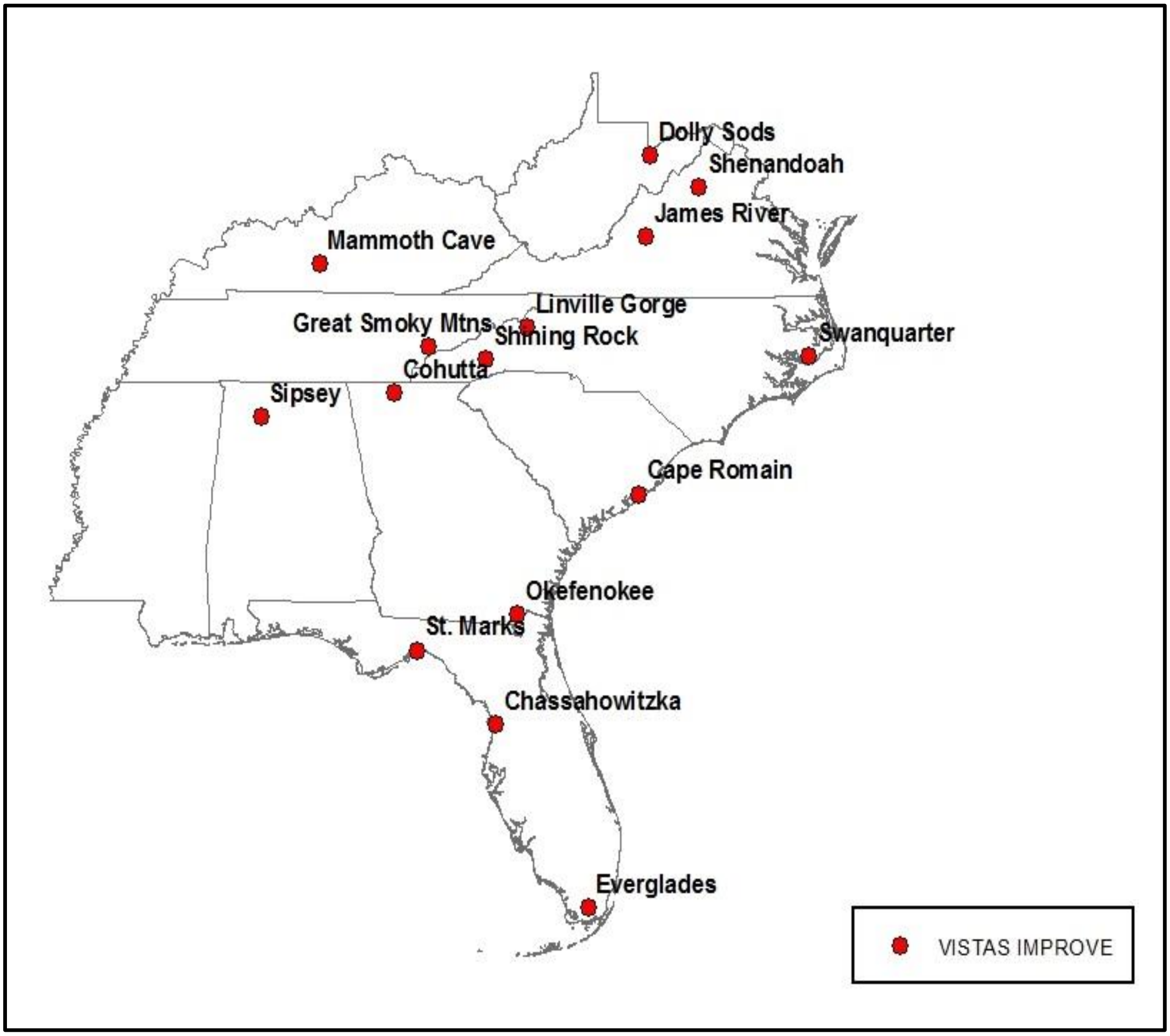


Figure 9-1: VISTAS States IMPROVE Monitoring Network

The IMPROVE measurements are central to Florida's regional haze monitoring strategy, and it is difficult to visualize how the objectives listed above could be met without the monitoring provided by IMPROVE. Any reduction in the scope of the IMPROVE network in Florida and neighboring Class I areas would jeopardize the state's ability to demonstrate reasonable progress toward visibility improvement in its Class I areas and plan for appropriate future programs. In particular, Florida's regional haze strategy relies on emission reductions that will result from federal programs, such as MATS, and reductions in neighboring states, which occur on different time scales and will most likely not be spatially uniform. Monitoring at every Class I area is important to document the different air quality responses to the emissions reductions that will occur during the second implementation period to document reasonable progress.

Any reduction of the IMPROVE network by shutting down these monitoring sites impedes tracking progress or planning improvements at the affected Class I areas. If any one of the three IMPROVE monitors are shut down, Florida, in consultation with the EPA and relevant Federal Land Managers, will develop an alternative approach for meeting the tracking goal, perhaps by seeking contingency funding to carry out limited monitoring or by relying on data from nearby urban monitoring sites to demonstrate trends in speciated $PM_{2.5}$ mass.

Data produced by the IMPROVE monitoring network will be used for preparing the five-year progress reports and the 10-year comprehensive SIP revisions, each of which relies on analysis of the preceding five years of IMPROVE monitor data. Consequently, the monitoring data from the IMPROVE sites needs to be readily available and up to date. Presumably, the IMPROVE network will continue to process information from its own measurements at about the same pace and with the same attention to quality as it has shown to date. A website has been maintained by Colorado State University, FLMs, and RPOs to provide ready access to the IMPROVE data and data analysis tools. These databases provide a valuable resource for states and the funding and necessary upkeep of the repository is crucial.

9.1. Conclusions

Florida relies on the IMPROVE monitoring network to fulfill the requirements in paragraphs 40 CFR 51.308(f)(6)(i) through (iv) and paragraph (vi).

- 51.803(f)(6)(i): Florida believes the existing IMPROVE monitors for the state's Class I areas are adequate and does not believe any additional monitoring sites or equipment are needed to assess whether RPGs for all mandatory Class I Federal areas within the state are being achieved.

- 51.308(f)(6)(ii): Data produced by the IMPROVE monitoring network will be used for preparing the five-year progress reports and the 10-year comprehensive SIP revisions, each of which rely on analysis of the preceding five years of IMPROVE monitor data.

- 51.308(f)(6)(iii): This provision for states with no mandatory Class I Federal areas does not apply to Florida.

- 51.308(f)(6)(iv): Florida believes the existing IMPROVE monitors for the State's Class I areas are sufficient for the purposes of this SIP revision. IMPROVE is a cooperative measurement effort managed by a Steering Committee that consists of representatives from various organizations (EPA, NPS, USFS, FWS, BLM, NOAA, four organizations representing state air quality organizations (NACAA, WESTAR, NESCAUM, and MARAMA), and three Associate Members: AZ DEQ, Env. Canada, and the South Korea Ministry of Environment). Florida believes that participation of the state organizations in the IMPROVE Steering Committee adequately represents the needs of the state. The IMPROVE program establishes current visibility and aerosol conditions in mandatory Class I areas; identifies chemical species and emission sources responsible for existing man-made visibility impairment; documents long-term trends in visibility; and provides regional haze monitoring at mandatory federal Class I areas. (Source: http://vista.cira.colostate.edu/Improve/improve-program/) The National Park Service (NPS) manages and oversees the IMPROVE monitoring network. The IMPROVE monitoring network samples particulate matter from which the chemical composition of the sampled particles is determined. The measured chemical composition is then used to calculate visibility. Samples are collected and data are reviewed, validated, and verified by NPS/NPS contractors before submission to EPA's Air Quality System (AQS), https://www.epa.gov/aqs). The network also posts raw (http://views.cira.colostate.edu/fed/) and summary data (http://vista.cira.colostate.edu/Improve/rhr-summary-data/) to assist states and local air agencies and multijurisdictional organizations. Details about the IMPROVE monitoring network and procedures are available at http://vista.cira.colostate.edu/Improve/.

- 51.308(f)(6)(v): The requirements of 40 CFR 51.308(f)(6)(v) are addressed in Section 4, Section 7.2.4 and Section 13.1 of the SIP. Florida will continue to participate in SESARM/VISTAS efforts for projecting future emissions and continue to comply with the requirements of the AERR to periodically update emissions inventories.

- 51.308(f)(6)(vi): There are no elements, including reporting, recordkeeping, or other measures, necessary to address and report on visibility for Florida's Class I areas or Class I areas outside the state that are affected by sources in Florida.

10. Consultation Process

The VISTAS states have jointly developed the technical analyses that define the amount of visibility improvement that can be achieved by 2028 as compared to the uniform rate of progress for each Class I area. VISTAS initially used an AoI analysis to identify the areas and source sectors most likely contributing to poor visibility in Class I areas. This AoI analysis involved running the HYSPLIT Model to determine the origin of the air parcels affecting visibility within each Class I area. This information was then spatially combined with emissions data to determine the pollutants, sectors, and individual sources that are most likely contributing to the visibility impairment at each Class I area. This information indicated that the pollutants and sector with the largest impact on visibility impairment in 2028 were SO_2 and NO_X from point sources. Next, VISTAS states used the results of the AoI analysis to identify sources to “tag” for PSAT modeling. PSAT modeling uses "reactive tracers" to apportion particulate matter among different sources, source categories, and regions. PSAT was implemented with the CAMx photochemical model to determine visibility impairment due to individual sources. PSAT results showed that in 2028 the majority of visibility impairment at VISTAS Class I areas will continue to be from point source SO_2 and NO_X emissions. Using the PSAT data, VISTAS states identified, for the reasonable progress analyses, sources shown to have a sulfate or nitrate impact on one or more Class I areas greater than or equal to 1.00% of the total sulfate plus nitrate point source visibility impairment on the 20% most impaired days for each Class I area. In addition to tagging individual sources, VISTAS also tagged statewide emissions of SO_2 and NO_X from each VISTAS state to determine how statewide emissions may affect Class I areas. The states collectively accept the conclusions of these analyses for use in evaluating reasonable progress.

10.1. Interstate Consultation

In accordance with 40 CFR 51.308(f)(2), the Department used the results of the PSAT analysis to determine how Florida’s state-wide emissions may affect Class I areas outside of Florida. In the PSAT analysis, VISTAS tagged statewide emissions of SO_2 and NO_X. Although PM is another pollutant that can contribute to visibility impairment, VISTAS did not tag PM emissions in the PSAT analysis after concluding that SO_2 and NO_X emissions, particularly from point sources, are projected to have the largest impact on visibility impairment in 2028.

Figure 10-1 below shows the relative contribution of Florida’s SO_2 and NO_X emissions to sulfate and nitrate visibility impairment at 57 Class I areas, compared to the relative contribution from other states and RPOs. Table 10-1 shows the top 10 Class I areas outside of Florida impacted by Florida emissions, ranked by absolute impact in inverse megameters (the table includes Florida’s estimated impact on Florida Class I areas for comparison). All Class I areas listed, except for Breton Islands in Louisiana, are VISTAS Class I areas. Florida consulted with all the VISTAS states throughout the SIP development process. Georgia also consulted with Florida regarding specific Florida facilities impacting its Class I areas. The only state in the list that Florida did not directly consult with is Louisiana. However, Florida did participate in CENSARA regional haze coordination calls. Louisiana also did not consider Florida to significantly impact Breton Islands and did not request consultation with Florida.

Table 10-1: Top 10 Class I areas outside Florida impacted by Florida emissions of SO_2 and NO_X, ranked by absolute impact. Florida's impact on Florida Class I areas is included for comparison.

Class I Area	State	Percent impact	Absolute impact (Mm^{-1})
CHAS	*FL*	*26.4%*	*4.13*
SAMA	*FL*	*15.2%*	*2.86*
OKEF	**GA**	14.2%	2.76
WOLF	**GA**	8.8%	1.69
EVER	*FL*	*32.1%*	*1.49*
ROMA	**SC**	4.1%	0.84
BRET2	**LA**	3.5%	0.82
SWAN	**NC**	1.6%	0.26
COHU	**GA**	1.1%	0.20
SIPS	**AL**	0.8%	0.18
SHRO	**NC**	0.5%	0.07
JOYC	**NC**	0.3%	0.06
GRSM	**NC, TN**	0.3%	0.05

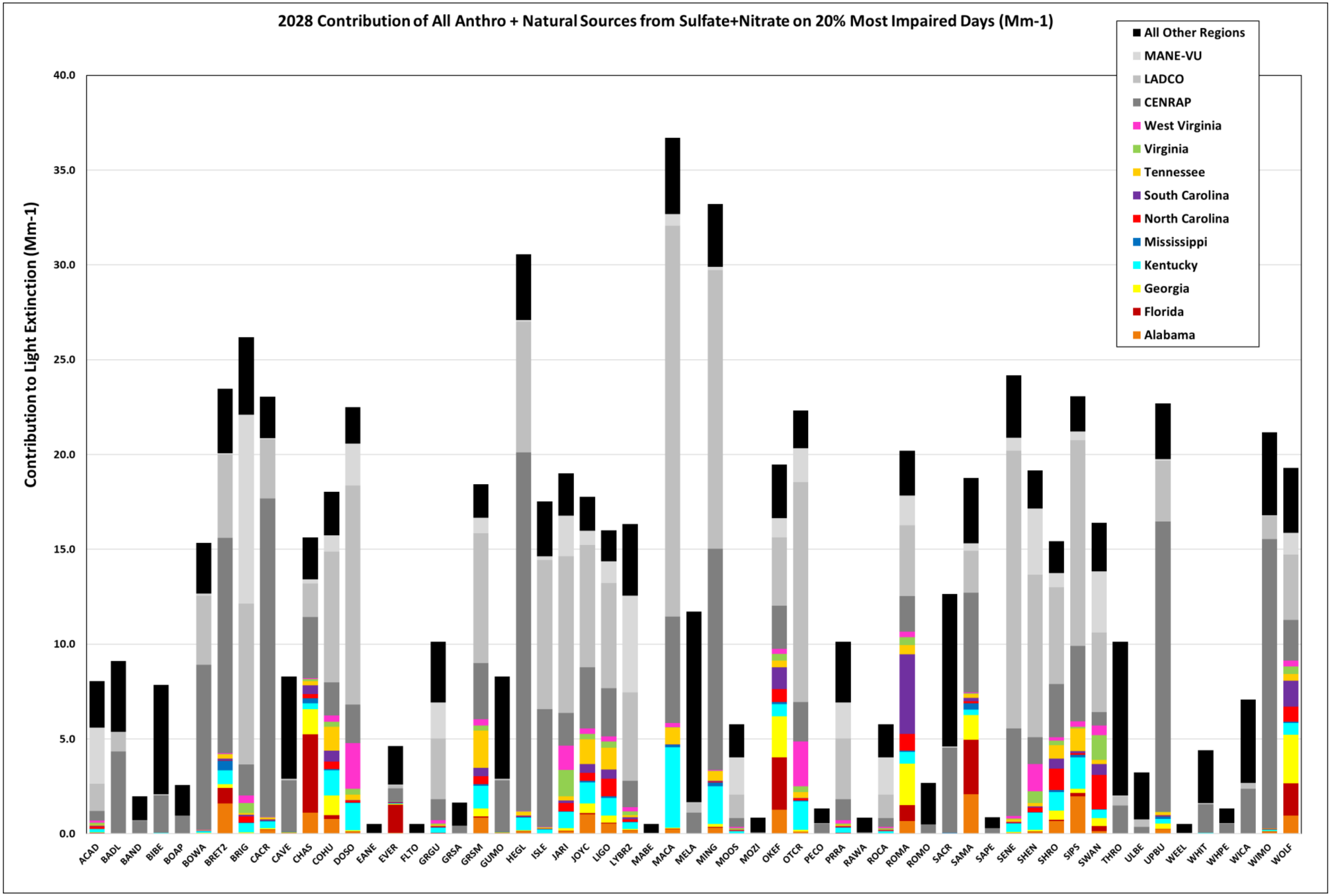


Figure 10-1: Relative contribution to sulfate and nitrate visibility impairment from SO_2 and NO_X emissions from all anthropogenic and natural sources.

In evaluating controls needed to assess reasonable progress, VISTAS states with any Class I areas initiated a consultation process with other VISTAS states with one or more facilities identified as having greater than or equal to 1.00% of the total sulfate plus nitrate point source visibility impairment on the 20% most impaired days. The letter requested that the VISTAS state provide a response indicating its plans for conducting a reasonable progress analysis for each facility. Florida contacted Georgia and Kentucky in December 2020 and asked these states to include the facilities listed in Table 7-26 in the state's reasonable progress analysis. These letters and responses to the letters are provided in Appendix F-1. Additionally, Alabama provided information to Florida about the Sanders Lead Co. facility (01109-985711) showing that this facility's recent emissions have significantly reduced from the initial 2028 projections of 7,961.1 tpy to about 1,400 tpy, bringing the PSAT results below 1.00% for Chassahowitzka and St. Marks (Appendix F-1c). Therefore, Florida did not need to send a consultation letter to Alabama.

Georgia also sent a letter to Florida requesting that Florida perform reasonable progress evaluations for five facilities: Nutrien White Springs Agricultural Chemical, Foley Mill, WestRock Fernandina Beach Mill, JEA Northside, and Seminole Electric (Appendix F-1d). As discussed in Section 7, Florida included all five of these facilities on the reasonable progress evaluation list. Florida has provided the completed reasonable progress evaluations to all VISTAS states along with this SIP Submittal and supporting documentation. Florida will continue to update Georgia on the status of the Foley Mill reasonable progress analysis.

In addition, VISTAS sent a letter to each non-VISTAS state with one or more facilities identified as having greater than or equal to 1.00% of the total sulfate plus nitrate point source visibility impairment on the 20% most impaired days in one or more VISTAS Class I areas. The letter requested that the non-VISTAS state verify if the 2028 SO_2 and NO_X emissions modeled for each facility identified in the letter were correct. If the emissions have decreased since the modeling was initiated, the non-VISTAS state was asked to provide updated emissions so that the facility contribution could be adjusted using the PSAT results to determine if additional analysis of controls would be necessary. If a non-VISTAS state did not decrease the 2028 emissions modeled, the non-VISTAS state was asked to provide a response indicating its plans for conducting a reasonable progress analysis for each facility. There were no facilities in non-VISTAS states that significantly contributed to Florida Class I areas.

The Department has not yet received a response from Georgia for Georgia Power Company – Plant Bowen or from Kentucky for Tennessee Valley Authority – Shawnee Fossil Plant.

10.2. Outreach

The VISTAS states participated in national conferences and consultation meetings with other states, RPOs, FLMs, and EPA throughout the SIP development process to share information.

VISTAS held calls and webinars with FLMs, EPA, RPOs and their member states, and other stakeholders (industry and non-governmental organizations) to explain the overall analytical approach, methodologies, tools, and assumptions used during the SIP development process and considered their comments along the way. The chronology of these meetings and conferences is presented in Table 10-2.

Table 10-2: Summary of VISTAS Consultation Meetings and Calls

Date	Meetings and Calls	Participants
December 5-7, 2017	Denver, CO, National Regional Haze Meeting – VISTAS States gave several presentations	FLMs; EPA OAQPS[1], Region 3, Region 4; RPOs; various VISTAS agency attendees
January 31, 2018	Teleconference and VISTAS Presentation	FLMs, EPA Region 4
August 1, 2018	Teleconference and VISTAS Presentation	FLMs, EPA OAQPS, Region 3, Region 4
September 5, 2018	Teleconference and VISTAS Presentation	RPOs, CC[2]/TAWG[3]
June 3, 2019	Teleconference and VISTAS Presentation	FLMs; EPA OAQPS, Region 3, Region 4; CC/TAWG
October 28-30, 2019	St Louis, MO, National Regional Haze Meeting – VISTAS States gave presentations	FLMs; EPA OAQPS, Region 3, Region 4; RPOs; various VISTAS agency attendees
April 2, 2020	Teleconference and VISTAS Presentation	FLMs; EPA OAQPS, Region 3, Region 4; CC/TAWG
April 21, 2020	Webinar and VISTAS Presentation	RPOs, CC/TAWG
May 11, 2020	Webinar and VISTAS Presentation	FLMs; EPA OAQPS, Region 3, Region 4; CC/TAWG
May 20, 2020	Webinar and VISTAS Presentation	Stakeholders; FLMs; EPA OAQPS, Region 3, Region 4; RPOs; and member states, STAD, CC/TAWG
August 4, 2020	Webinar and VISTAS Presentation	FLMs; EPA OAQPS, Region 3, Region 4; RPOs and Member States; CC/TAWG
October 26, 2020	Fall 2020 EPA Region 4 and State Air Director's Call - Webinar and VISTAS Presentation	EPA Region 3, EPA Region 4

[1]Office of Air Quality Planning and Standards (OAQPS)
[2]VISTAS Coordinating Committee (CC)
[3]VISTAS Technical Advisory Work Group (TAWG)

Beginning in January 2018, VISTAS held the first of several formal consultation calls with EPA and the FLMs to review the methodologies used to evaluate source lists for four-factor analyses. The development of AoIs for each Class I area with the HYSPLIT model was presented to identify source regions for which additional controls might be considered and that are likely to have the greatest impact on each Class I area. Additionally, information was shared on how states identified specific facilities within the AoIs to be tagged by the CAMx photochemical model to further identify impacts associated with those facilities on each Class I area. Based on the results of these two analyses, each state agreed to evaluate reasonable control measures for sources that met or exceeded individual state thresholds for four-factor analyses. Each state would consider sources within their state and would identify sources in neighboring states for consideration. States acknowledged that the review process would differ among states since some Class I areas are projected to see visibility improvements near the uniform rate of progress while most Class I areas are projected to have greater improvements than the uniform rate of progress.

Subsequent calls were held with EPA, FLMs and stakeholders to share revised analyses of sources in their state and neighboring states for each Class I area, as well as their criteria for listing sources and their plans for further interstate consultation. Documentation of these calls can be found in Appendix F-3.

Additionally, Florida attended a National Regional Haze Conference in St. Louis, Missouri in October 2019 to discuss national and regional modeling to date and to plan next steps for submitting 2028 regional haze SIPs. Florida was part of a southeastern state breakout session with FLMs and EPA discussing the modeling and future expectations from all parties. Florida also regularly participated in CENSARA calls.

10.3. Consultation with MANE-VU

The following information documents the VISTAS states' participation in Mid-Atlantic/Northeast Visibility Union (MANE-VU) consultation meetings. Table 10-3 provides the correspondence and meetings that occurred during the consultation process. MANE-VU prepared the ***MANE-VU Regional Haze Consultation Report***, which contains a record of the consultation meetings, comments received, and responses to comments.[58] Appendix F-4 provides documentation of Florida's consultation with MANE-VU including Florida's and VISTAS's comments on the MANE-VU Ask.

On October 16, 2016, MANE-VU notified Alabama, Florida, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia that its analysis of upwind emissions from these states may contribute to visibility impairment at one or more MANE-VU Class I areas located in Maine, New Hampshire, New Jersey, and Vermont. MANE-VU invited each aforementioned VISTAS state to participate in its consultation process involving five conference calls from October 20, 2017 to March 23, 2018 to explain their methodologies, data sources, and assumptions used in its contribution analyses. MANE-VU's technical analyses were based on

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[58] "MANE-VU Regional Haze Consultation Report," July 27, 2018, MANE-VU Technical Support Committee, URL: https://otcair.org/MANEVU/Upload/Publication/Correspondence/MANE-VU_RH_ConsultationReport_Appendices_ThankYouLetters_08302018.pdf

actual 2015 emissions for EGUs and 2011 emissions for other emission sources. MANE-VU's criteria for identifying upwind states for consultation included:

- Point Source Emissions Analysis: Kentucky, North Carolina, Virginia, and West Virginia were identified as having at least one facility estimated to contribute ≥3 Mm^{-1} to light extinction in at least one MANE-VU Class I area based on CALPUFF modeling of the facility's SO_2 and NO_X emissions.

- Statewide Emissions Analysis for all Sectors: Alabama, Florida, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia were estimated to contribute ≥2% of the visibility impairment at one or more MANE-VU Class I areas and/or an average mass impact of over 1% (0.01 $\mu g/m^3$). This methodology involved a weight-of-evidence approach based on emissions (tons per year) divided by distance (kilometers) (Q/d) calculations, CALPUFF modeling, and the use of HYSPLIT back trajectories as a quality check.

All seven VISTAS states participated in MANE-VU's five consultation calls and reviewed the technical information supporting MANE-VU's conclusions. On January 27, 2018, VISTAS submitted a letter to MANE-VU documenting its appreciation for the opportunity to participate in the consultation process and identified the following concerns and recommendations:

- <u>Timing:</u> At the time the consultation calls were held, the MANE-VU states indicated that they planned to submit their regional haze SIPs to EPA by the original July 2018 deadline. VISTAS noted that its states planned to complete their regional haze technical analysis in 2019 with the intention of submitting regional haze SIPs by July 31, 2021. The differing schedules resulted in the seven VISTAS states included in MANE-VU's Ask being requested to assess the MANE-VU analysis without the benefit of the forthcoming VISTAS technical work. Subsequently, schedules were delayed and VISTAS has shared the results of its emissions inventory and modeling analyses with the MANE-VU states during consultation calls in 2020 (see Table 10-2). VISTAS's technical analyses, which are based on more recent emissions inventory data and robust modeling tools, indicate that VISTAS state contributions to MANE-VU Class I areas are below the thresholds established by MANE-VU.

- <u>Technical Analysis – Inventories, Modeling, and Evaluation:</u> The MANE-VU states' analysis used emission inventories that are inconsistent with the recent EPA regional haze modeling platform. These inventories do not fully reflect emission reductions expected from southeastern EGUs by 2028 and other sources as well. Modeling results derived from use of the outdated emissions inventories may not allow conclusive determinations of impacts, if any, from VISTAS states on Class I areas in the MANE-VU region.

In many cases, the sources of the alleged contributions to downwind receptors are located thousands of miles away from the MANE-VU Class I areas. The MANE-VU states used the CALPUFF model and the Q/d screening approach to identify contributions that they allege are significant. CALPUFF should not be used for transport distances greater than 300 km since there are serious conceptual concerns with the use of puff dispersion models for very long-range transport which can result in overestimations of surface concentrations by a factor of three to four.[59]

The preamble to the recent Revisions to the Guideline on Air Quality Models that modified Appendix W of 40 CFR Part 51 states, in part, "the EPA has fully documented the past and current concerns related to the regulatory use of the CALPUFF modeling system and believes that these concerns, including the well documented scientific and technical issues with the modeling system, support the EPA's decision to remove it as a preferred model in Appendix A of the Guideline." "[60]

The reliability of the Q/d screening approach diminishes over distance and especially beyond 300 km. If the MANE-VU states wish to evaluate emission impacts more than 300 km downwind from sources, a scientifically reliable approach is essential such as the CAMx model with the PSAT source apportionment method.

In response to VISTAS concerns about inaccuracies in the MANE-VU analysis that were shared during the December 18, 2018 technical call, the MANE-VU states suggested that the seven VISTAS states could reassess contributions using their own information to correct the MANE-VU analysis. The VISTAS states affirmed their commitment to conduct a thorough technical review of emission impacts during their forthcoming analysis. However, it was incumbent on the MANE-VU states to correct the errors inherent in their own analysis and reassess the states with which consultation would be necessary.

The MANE-VU Ask included year-round use of effective control technologies on EGUs; a four-factor analysis on sources with potential for visibility impacts of $\geq 3.0\ Mm^{-1}$ at any MANE-VU Class I area; establishment of an ultra-low sulfur fuel oil standard; updated permits, enforceable agreements, and/or rules to lock in lower emission rates for EGUs and other large emission sources that had recently reduced emissions or were scheduled to do so; and efforts to decrease energy demand through use of energy efficiency and increased use of combined heat and power and other clean distributed generation

[59] *Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts* (December 1998).
[60] *Federal Register,* Vol. 82, No. 10, Tuesday, January 17, 2017, Page 5195.

technologies. The MANE-VU Ask failed to recognize fully the improved controls, fuel switches, retirements, and energy demand reductions that had already been achieved in the Southeast. Further, the MANE-VU states suggested that the Southeast adopt control measures that would produce little if any visibility improvement at MANE-VU Class I areas. VISTAS recommended that the MANE-VU states refine their analyses and establish a sound basis for any actions requested of the seven VISTAS states and incorporate such expectations in MANE-VU SIPs.

- Permanent and Enforceable: Regional haze SIPs (including the reasonable progress goals that are set for each Class I area) should only include emission reductions that are permanent, quantifiable, and enforceable. Therefore, the MANE-VU states should only include in their regional haze SIPs emission control presumptions for the seven VISTAS states that are clearly necessary and effective and have been made permanent and enforceable via state rulemaking or permit revisions. For MANE-VU states to include within their regional haze SIPs emission controls in other states that are not permanent and enforceable, and which the state in question has no intention of adopting, would be inconsistent with the CAA and RHR and could result in adverse comments from the seven VISTAS states during the MANE-VU regional haze SIP public comment period.

During the consultation process, North Carolina, Tennessee, Virginia, and West Virginia submitted to MANE-VU updated information on emissions associated with facilities identified in the MANE-VU Ask and documenting concerns with MANE-VUs approach and conclusions. As a result of their active participation the MANE-VU consultation process, the VISTAS states fulfilled the consultation requirements specified in the RHR (51.308(f)(2)(ii)).

MANE-VU did not identify any specific Florida facilities in the MANE-VU Ask. However, on January 19, 2018, Florida sent a response letter to MANE-VU and noted several disagreements with MANE-VU's analysis (Appendix F-4c), summarized below.

MANE-VU used outdated 2015 emissions in their Q/d analysis. With a threshold of 2.0%, MANE-VU concluded that Florida contributed significantly to visibility impairment the Acadia National Park in Maine, with 2.1% of the total contribution. However, Florida's emissions have decreased significantly since 2015, which would bring Florida below this threshold. From 2015 to 2019, Florida's stationary source SO_2 emissions have decreased 16.7% and NO_X emissions have decreased 21.3%. In addition, Florida's stationary source emissions are expected to decrease even further by 2028.

MANE-VU also utilized NOAA's HYSPLIT model to determine the source of emissions on the 20% most impaired days in each Class I area for 2002, 2011, and 2015. The results were used as a "qualitative opportunity to cross check the reasonability for including states." In other words, the trajectory analysis was used to determine the possibility that emissions from a state could be transported to a MANE-VU Class I area. However, MANE-VU did not use the results of this quality check to change which states were included in the Ask. In Acadia National Park, the only Class I area that Florida was tied to, only 0.01% of all trajectories on the 20% most impaired days in 2015 passed over Florida. This is a very insignificant number and brings into question the likelihood of Florida emissions impacting a Class I area over 1,800 kilometers away. The lack of back trajectories over Florida also emphasizes the limits of the Q/d analysis. Despite this quality check, MANE-VU still included Florida in the Ask.

Based on limits to the Q/d analysis, the lack of trajectories crossing over Florida, significant reductions in SO_2 and NO_X in Florida since 2015, and other points made above, Florida disagrees that Florida contributes significantly to any MANE-VU Class I area, and therefore Florida did not implement the emissions reductions measures of the Ask.

Table 10-3: MANE-VU Consultation with VISTAS States - Correspondence and Meetings

Date	Description
October 16, 2017	Letter from Dave Foerter, Executive Director, MANE-VU/OTC, to Director Lance LeFleur, Alabama Department of Environmental Management. Purpose: Invitation to join State-to-State consultation meetings starting October 20, 2017.
October 16, 2017	Letter from Dave Foerter, Executive Director, MANE-VU/OTC, to Secretary Noah Valenstein, Florida Department of Environmental Protection. Purpose: Invitation to join State-to-State consultation meetings starting October 20, 2017.
October 16, 2017	Letter from Dave Foerter, Executive Director, MANE-VU/OTC, to Commissioner Aaron Keatley, Kentucky Department of Environmental Protection. Purpose: Invitation to join State-to-State consultation meetings starting October 20, 2017.
October 16, 2017	Letter from Dave Foerter, Executive Director, MANE-VU/OTC, to Secretary Michael Regan, North Carolina Department of Environmental Quality (NCDEQ) (formerly Department of Environment and Natural Resources). Purpose: Invitation to join State-to-State consultation meetings starting October 20, 2017.
October 16, 2017	Letter from Dave Foerter, Executive Director, MANE-VU/OTC, to Commissioner Bob Martineau, Tennessee Department of Environment and Conservation. Purpose: Invitation to join State-to-State consultation meetings starting October 20, 2017.
October 16, 2017	Letter from Dave Foerter, Executive Director, MANE-VU/OTC, to Director David Paylor, Virginia Department of Environmental Quality. Purpose: Invitation to join State-to-State consultation meetings starting October 20, 2017.
October 16, 2017	Letter from Dave Foerter, Executive Director, MANE-VU/OTC, to Secretary Austin Caperton, West Virginia Department of Environmental Protection. Purpose: Invitation to join State-to-State consultation meetings starting October 20, 2017.
October 20, 2017	MANE-VU Conference Call. Inter-RPO Consultation #1, Introduction and Overview of MANE-VU Analyses and Ask.
December 1, 2017	MANE-VU Conference Call. Inter-Regional Consultation #2, Discussion of the Ask and listening to upwind states and FLM questions.
December 18, 2017	MANE-VU Conference Call. Inter-Regional Consultation #3, Overview of technical analyses behind the Ask, source contributions, 4-factor analysis, and available technical products.
December 29, 2017	Letter from Laura Mae Crowder, WV Division of Air Quality, Deputy Director/Assistant Director of Planning, to Dave Foerter, Executive Director, MANE-VU/OTC. Purpose: Provide technical information on emission sources.
December 22, 2017	Email from Mark A. Reynolds, Environmental Consultant, Tennessee Department of Environment and Conservation to Joseph Jakuta, MANE-VU/OTC. Purpose: Provided additional information on EGU emissions and Cargill Corn Milling facility.

Date	Description
January 12, 2018	MANE-VU Conference Call. Inter-Regional Consultation #4, Reasonable Progress Overview.
January 18, 2018	Email from Doris McLeod, Air Quality Planner, Virginia Department of Environmental Quality to Joseph Jakuta, MANE-VU/OTC. Purpose: Information on closure of coal fired boilers at Radford Army Ammunition Plant.
January 19, 2018	Letter from Jeffery F. Koerner, Director, Division of Air Resource Management, Florida Department of Environmental Protection. Purpose: Comments on MANE-VU Inter-RPO Ask regarding flaws in the analysis and disagreement that Florida contributes significantly to MANE-VU Class I areas.
January 27, 2018	Letter from John E. Hornback, Executive Director, Metro 4/SESARM/VISTAS, to Dave Foerter, Executive Director, MANE-VU/OTC. Purpose: Comments on timing; technical analysis – inventories, modeling, and evaluation; and permanence and enforceability of control measures not adopted by VISTAS states.
January 30, 2018	Email from Randy Strait, Supervisor of Attainment Planning Branch, Division of Air Quality, NCDEQ to Joseph Jakuta, Program Manager, MANE-VU/OTC, and David Healy, Air Quality Analyst/Modeler, New Hampshire Dept. of Environmental Services. Purpose: Documentation of errors with CALPUFF for KapStone Kraft Paper and documentation showing that 2016 SO_2 emissions were 95% lower and 2016 NO_X emissions were 18% lower than in the 2011 emissions used in MANE-VU's modeling. Email reply from Dave Healy on January 31, 2018, confirmed that there was an error in the Ask and that KapStone Kraft Paper's contribution is $<3Mm^{-1}$.
February 16, 2018	Letter from Michael Abraczinskas, Director, Division of Air Quality, NCDEQ to Dave Foerter, Executive Director, MANE-VU/OTC. Purpose: Comments on MANE-VU Inter-RPO Ask regarding flaws in analysis for North Carolina emissions sources.
March 23, 2018	MANE-VU Conference Call. Inter-RPO Consultation #5. Executive Summaries, SIP submittal plans, and perspectives from upwind states.
May 8, 2018	Letter from Clark Freise, MANE-VU Chair (NH DES) and David Foerter, MANE-VU Executive Director, to Director Lance LeFleur, Alabama Department of Environmental Management. Purpose: Acknowledgement of participation in MANE-VU consultation calls and receipt of comments on MANE-VU Ask.
May 8, 2018	Letter from Clark Freise, MANE-VU Chair (NH DES) and David Foerter, MANE-VU Executive Director, to Commissioner Aaron Keatley, Kentucky Department of Environmental Protection. Purpose: Acknowledgement of participation in MANE-VU consultation calls and receipt of comments on MANE-VU Ask.
May 8, 2018	Letter from Clark Freise, MANE-VU Chair (NH DES) and David Foerter, MANE-VU Executive Director, to Secretary Noah Valenstein, Florida Department of Environmental Protection. Purpose: Acknowledgement of participation in MANE-VU consultation calls and receipt of comments on MANE-VU Ask.
May 8, 2018	Letter from Clark Freise, MANE-VU Chair (NH DES) and David Foerter, MANE-VU Executive Director, to Secretary Michael Regan, North Carolina NCDEQ. Purpose: Acknowledgement of participation in MANE-VU consultation calls and receipt of comments on MANE-VU Ask.
May 8, 2018	Letter from Clark Freise, MANE-VU Chair (NH DES) and David Foerter, MANE-VU Executive Director, to Commissioner Bob Martineau, Tennessee Department of Environment and Conservation. Purpose: Acknowledgement of participation in MANE-VU consultation calls and receipt of comments on MANE-VU Ask.
May 8, 2018	Letter from Clark Freise, MANE-VU Chair (NH DES) and David Foerter, MANE-VU Executive Director, to Director David Paylor, Virginia Department of Environmental Quality. Purpose: Acknowledgement of participation in MANE-VU consultation calls and receipt of comments on MANE-VU Ask.
May 8, 2018	Letter from Clark Freise, MANE-VU Chair (NH DES) and David Foerter, MANE-VU Executive Director, to Cabinet Secretary Austin Caperton, West Virginia Department of Environmental Protection. Purpose: Acknowledgement of participation in MANE-VU consultation calls and receipt of comments on MANE-VU Ask.

10.4. State and Federal Land Manager Consultation

The Regional Haze Rule requires states to provide opportunity for consultation with Federal Land Managers early in the SIP development process (40 CFR 51.308(i)(2)):

> The State must provide the Federal Land Manager with an opportunity for consultation, in person at a point early enough in the State's policy analyses of its long-term strategy emission reduction obligation so that information and recommendations provided by the Federal Land Manager can meaningfully inform the State's decisions on the long-term strategy. The opportunity for consultation will be deemed to have been early enough if the consultation has taken place at least 120 days prior to holding any public hearing or other public comment opportunity on an implementation plan (or plan revision) for regional haze required by this subpart. The opportunity for consultation on an implementation plan (or plan revision) or on a progress report must be provided no less than 60 days prior to said public hearing or public comment opportunity. This consultation must include the opportunity for the affected Federal Land Managers to discuss their:
>
> (i) Assessment of impairment of visibility in any mandatory Class I Federal area; and
>
> (ii) Recommendations on the development and implementation of strategies to address visibility impairment.

10.4.1. Federal Land Manager 60-day Comment Period

On April 2, 2021, the Department sent consultation letters to the FWS, FS, and NPS Federal Land Managers along with a copy of the draft SIP for a 60-day comment period (a copy of the consultation letters are provided in Appendix H-1 through Appendix H-3). On May 18, 2021, the NPS held a consultation call with the Department. Representatives from FWS and FS also attended. On June 1, 2021, NPS provided the Department with comments commending Florida’s regional haze SIP and how it satisfies reasonable progress for Everglades (Appendix H-4). Appendix H-5 includes a summary of the presentation slides and notes from the consultation call.

As part of the consultation call, NPS requested clarification on why the Miami-Dade Water and Sewer Department facility (Facility ID 12086-641611) was not selected for analysis. The Department clarified that the original projected 2028 SO_2 emissions from this facility (61.1 tpy) were based on 2011 emissions, when the facility was using higher sulfur content fuel. However, recent actual emissions are significantly lower due to use of lower sulfur content fuel, which the facility is expected to continue to use (average SO_2 emissions for 2017 – 2019 are 9.5 tons per year). Additionally, as discussed in Section 7.6.3, the AoI analysis likely overpredicted this facility's impact at Everglades since this is a small source located very near the Class I area. For these reasons, the Department did not select the facility for analysis.

NPS also recommended that the Department update the interest rates used in the four factor analyses, which the Department has done as discussed in Section 7.8.

Although NPS did have concerns about the VISTAS-wide methodologies used to select sources and pollutants for reasonable progress analyses, NPS noted that these concerns were not applicable to Florida as Everglades has not observed increasing nitrate concentrations on the 20% most impaired days and it is the least impaired NPS Class I areas in the VISTAS region. The Department acknowledged NPS comments as not being applicable to Florida and, accordingly, did not update the SIP to address these concerns.

10.4.2. Continuing Consultation

40 CFR 51.308(i)(4) requires that the regional haze SIP include procedures for continuing consultation between the states and FLMs on the implementation of the visibility protection program. Florida commits to ongoing consultation with the FLMs. Florida will follow the consultation requirements in 40 CFR 51.308(i)(3) on any plan revision or progress report, and will engage with the FLMs upon request on any matters related to regional haze affected by Florida sources.

11. Comprehensive Periodic Implementation Plan Revisions

40 CFR 51.308(f) requires Florida to revise its regional haze SIP and submit a plan revision to the EPA by July 31, 2021, July 31, 2028, and every ten years thereafter. This plan is submitted in order to meet the July 31, 2021, requirement. In accordance with the requirements listed in Section 51.308(f) of the RHR, Florida commits to revising and submitting this regional haze SIP by July 31, 2028, and every ten years thereafter.

In addition, Section 51.308(g) requires periodic reports evaluating progress towards the RPGs established for each mandatory Class I area. The periodic reports are due by January 31, 2025, July 31, 2033, and every ten years thereafter. Florida commits to meeting all of the requirements for 40 CFR 51.308(g), including revising and submitting a regional haze progress report by January 31, 2025, July 31, 2033, and every ten years thereafter.

The progress report will evaluate the progress made towards the RPG for each of the mandatory federal Class I areas located within Florida and in each mandatory federal Class I area located outside Florida that may be affected by emissions from South Carolina sources. All requirements listed in Section 51.308(g) shall be addressed in the periodic report.

The requirements listed in 51.308(g) include the following:

(1) A description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory Class I Federal areas both within and outside the state.

(2) A summary of the emissions reductions achieved throughout the state through implementation of the measures described in paragraph 51.308(g)(1).

(3) For each mandatory Class I Federal area within the state, the state must assess the following visibility conditions and changes, with values for most impaired, least impaired and/or clearest days as applicable expressed in terms of 5-year averages of these annual values. The period for calculating current visibility conditions is the most recent 5-year period preceding the required date of the progress report for which data are available as of a date 6 months preceding the required date of the progress report.

  (i) The current visibility conditions for the most impaired and clearest days;

  (ii) The difference between current visibility conditions for the most impaired and clearest days and baseline visibility conditions;

(iii) The change in visibility impairment for the most impaired and clearest days over the period since the period addressed in the most recent plan required under paragraph 51.308(f).

(4) An analysis tracking the change over the period since the period addressed in the most recent plan required under paragraph 51.308(f) in emissions of pollutants contributing to visibility impairment from all sources and activities within the state. Emissions changes should be identified by type of source or activity. With respect to all sources and activities, the analysis must extend at least through the most recent year for which the state has submitted emission inventory information to the Administrator in compliance with the triennial reporting requirements of Subpart A of 40 CFR Part 51 as of a date six months preceding the required date of the progress report. With respect to sources that report directly to a centralized emissions data system operated by the Administrator, the analysis must extend through the most recent year for which the Administrator has provided a state-level summary of such reported data or an internet-based tool by which the state may obtain such a summary as of a date six months preceding the required date of the progress report. The state is not required to backcast previously reported emissions to be consistent with more recent emissions estimation procedures, and may draw attention to actual or possible inconsistencies created by changes in estimation procedures.

(5) An assessment of any significant changes in anthropogenic emissions within or outside the state that have occurred since the period addressed in the most recent plan required under 40 CFR 51.308(f) including whether or not these changes in anthropogenic emissions were anticipated in that most recent plan and whether they have limited or impeded progress in reducing pollutant emissions and improving visibility.

(6) An assessment of whether the current implementation plan elements and strategies are sufficient to enable the state, or other states with mandatory Class I Federal areas affected by emissions from the state, to meet all established reasonable progress goals for the period covered by the most recent plan required under 40 CFR 51.308(f).

(7) For progress reports for the first implementation period only, a review of the state's visibility monitoring strategy and any modifications to the strategy as necessary.

(8) For a state with a long-term strategy that includes a smoke management program for prescribed fires on wildland that conducts a periodic program assessment, a summary of the most recent periodic assessment of the smoke management program including conclusions if any that were reached in the assessment as to whether the program is meeting its goals regarding improving ecosystem health and reducing the damaging effects of catastrophic wildfires.

More specifically, the five-year Progress Report (due by January 31, 2025, July 31, 2033, and every 10 years thereafter.) will examine the effect of emission reductions as well as seek to evaluate the effectiveness of emission management measures implemented. Therefore, this Progress Report will provide for a comparison of emission inventories, ultimately expressing the change in visibility for the most impaired and least impaired days over the past five years.

Moreover, due to the uncertainty of some measures, this Progress Report will also provide the opportunity to evaluate the overall effectiveness of proposed measures to reduce visibility impairment to include the effect of state and federal measures.

In keeping with the EPA's requirements and recommendations related to consultation, each five-year review will also enlist the support of appropriate state, local, and tribal air pollution control agencies as well as the corresponding FLMs.

12. Determination of the Adequacy of the Existing Plan

At the same time Florida is required to submit any progress report to EPA, depending on the findings of the five-year progress report, Florida 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) If Florida determines that the existing SIP requires no further substantive revision in order to achieve established goals, it will provide to the EPA a declaration that further revision of the SIP is not needed.

(2) If Florida determines that the existing SIP may be inadequate to ensure reasonable progress due to emissions from other states that participated in the regional planning process, it will provide notification to the EPA and collaborate with the states that participated in regional planning to address the SIP's deficiencies.

(3) If Florida determines that the current SIP may be inadequate to ensure reasonable progress due to emissions from another country, it will provide notification of such, along with available information making such a demonstration, to the EPA.

(4) If Florida determines that the existing SIP is inadequate to ensure reasonable progress due to emissions within the state, it will revise its SIP to address the plan's deficiencies within one year after submitting such notification to the EPA.

13. Progress Report

13.1. Background

On March 19, 2010, Florida submitted for approval its SIP for regional haze to the EPA Region 4. Subsequent to this submission, Florida amended its plan on August 31, 2010 and September 17, 2012. Florida's regional haze plan documents Florida's long-term plan for improving visibility in three of the state's federal Class I areas as well as assisting with improvement of visibility in Class I areas located outside of the state. The SIP includes specific RPGs for visibility improvement at milestones that start in 2018. The ultimate goal is to reach background visibility levels in the Class I areas. Florida's Class I areas regulated for visibility are Everglades, Chassahowitzka, and St. Marks.

Subparagraph 40 CFR 51.308(g) of the Regional Haze Rule requires that states report on the success of the long-term strategy at specific intervals. On March 10, 2015, Florida submitted the first regional haze progress report to EPA, which demonstrated that Florida was on track to meet the RPGs set in the regional haze SIP.

This progress report, in accordance with EPA's requirements, contains the following elements:

- Status of implementation of the control measures included in the original SIP;
- Summary of the emissions reductions achieved through the above-referenced control measures;
- Assessment of visibility conditions and changes for each Class I area located within the state;
- Analysis tracking the change over the past five years in emissions of pollutants contributing to visibility impairment from all sources and activities within Florida;
- Assessment of any significant changes in anthropogenic emissions within the past five years that have limited or impeded progress in reducing pollutant emissions and improving visibility;
- An assessment of whether the current implementation plan elements and strategies are sufficient to enable the state, or other states with mandatory Federal Class I areas affected by emissions from the state, to meet all established reasonable progress goals; and
- A review of the state's visibility monitoring strategy and any modifications to the strategy as necessary.

Although future planning periods will focus on the most anthropogenically impaired ("most impaired") visibility days, the work completed in the first planning period and the development of the 2018 RPGs focused on the worst visibility days. In order to properly compare current conditions to the 2018 RPGs, this progress report includes visibility data for the 20% worst visibility days, in addition to visibility data for the 20% most impaired days as required by the regional haze rule.

13.1.1. Florida's Long-term Strategy for Visibility Improvement

In Section 7.4 of Florida's Regional Haze Plan, atmospheric ammonium sulfate was identified as the largest contributor to visibility impairment in Class I areas throughout the southeastern United States during the baseline period. Emissions sensitivity modeling performed for VISTAS determined that the most effective ways to reduce ammonium sulfate were to reduce SO_2 emissions from EGUs and, with an important but smaller impact, to reduce SO_2 emissions from non-utility industrial point sources. SO_2 reductions from point sources were therefore identified as the focus of Florida's long-term strategy for visibility improvement.

The bar charts in Figure 13-1, Figure 13-2, and Figure 13-3 show the speciated average light extinction for Florida's Class I areas and demonstrate that sulfates have continued to be a significant contributor to light extinction since submittal of the last progress report, although the relative contribution from sulfates is decreasing over time. OM, which is mainly from natural sources such as fires, also shows a significant contribution to light extinction in some years. The significantly high contribution from OM seen at Everglades in 2016 (over 500 Mm^{-1}, compared with 5-10 Mm^{-1} from OM in all other years) was confirmed as real and was due to the Long Pine Key Wildfire event from April 10, 2016 through April 17, 2016. This wildfire occurred extremely close to the Everglades IMPROVE site, causing significantly high measurements from smoke.

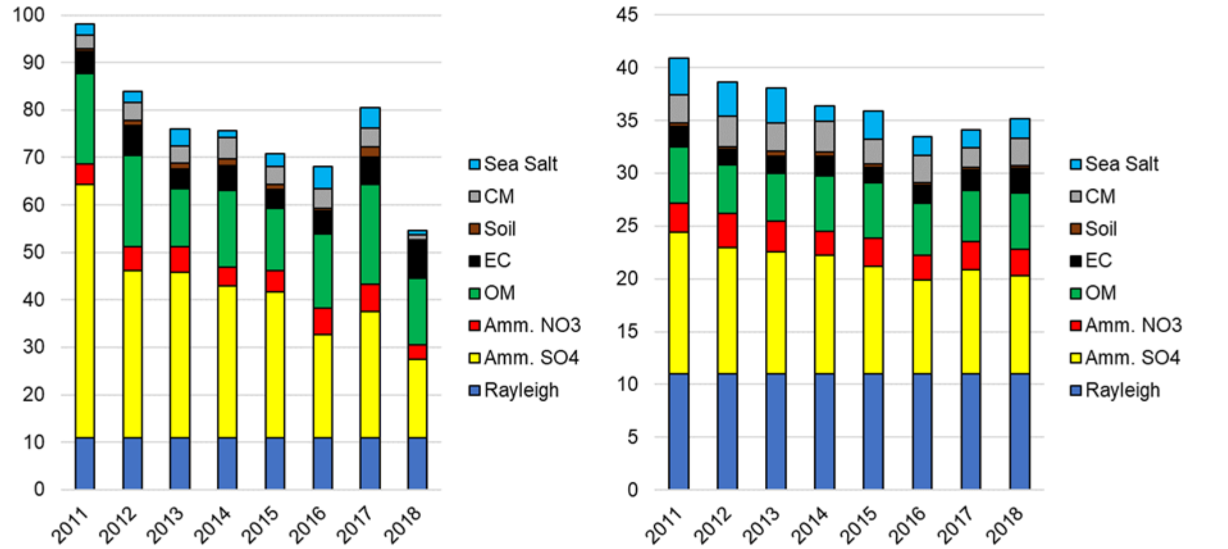

Figure 13-1: Annual Average Light Extinction (Mm^{-1}) for the 20% Worst Visibility Days (left) and the 20% Clearest Visibility Days (right) at Chassahowitzka

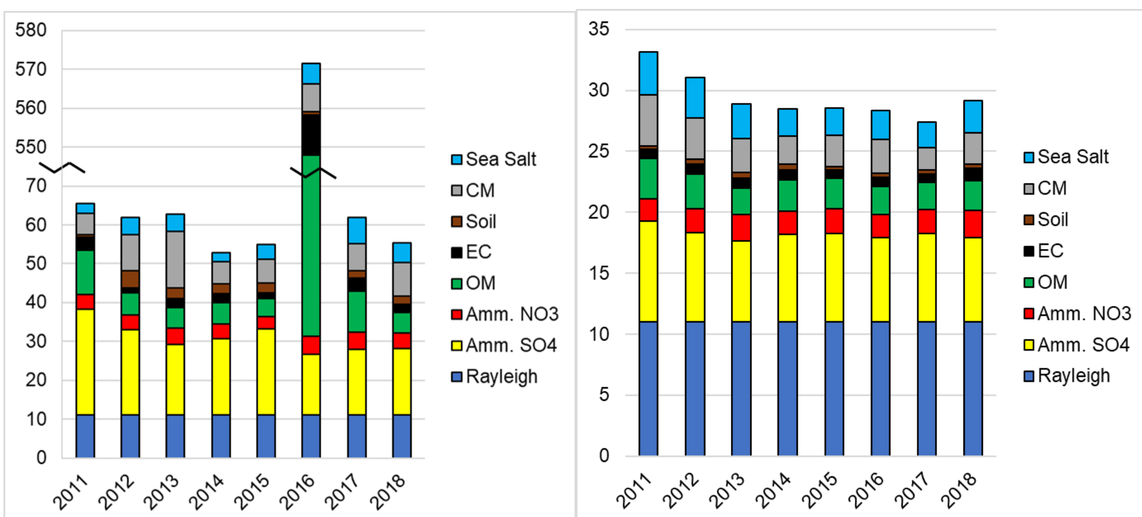

Figure 13-2: Annual Average Light Extinction (Mm^{-1}) for the 20% Worst Visibility Days (left) and the 20% Clearest Visibility Days (right) at Everglades

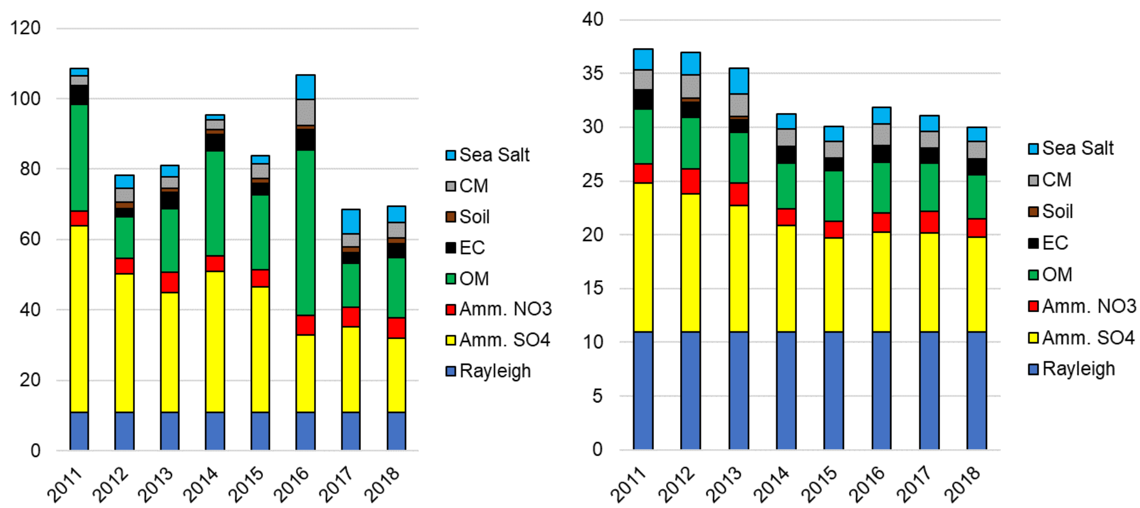

Figure 13-3: Annual Average Light Extinction (Mm^{-1}) for the 20% Worst Visibility Days (left) and the 20% Clearest Visibility Days (right) at St. Marks

13.1.2. 2018 Reasonable Progress Goals for Florida's Class I Areas

Table 13-1 and Table 13-2 show the 2018 RPGs for Florida's Class I areas on the 20% worst and 20% best visibility days, respectively. As seen in these tables, all three Florida Class I areas have met the 2018 RPGs.

Table 13-1: 2018 RPGs for Visibility Impairment in Florida's Class I Areas, 20% Worst Days

Class I Area	Baseline Average (2000-2004)	2018 Average (2014-2018)	2018 Goal	Natural Background
Chassahowitzka	25.75 dv	19.58 dv	22.27 dv	11.03 dv
Everglades	22.30 dv	17.74 dv	19.80 dv	12.09 dv
St. Marks	26.31 dv	20.09 dv	22.92 dv	11.67 dv

Table 13-2: 2018 RPGs for Visibility Impairment in Florida's Class I Areas, 20% Clearest Days

Class I Area	Baseline Average dv (2000-2004)	2018 Average dv (2014-2018)	2018 Goal (dv)	Natural Background (dv)
Chassahowitzka	15.60	12.41	15.60 or less*	5.91
Everglades	11.69	10.37	11.69 or less*	5.21
St. Marks	14.34	11.15	14.34 or less*	5.39

*The regional haze requirement for the 20% clearest days is to maintain the visibility impairment at or below the baseline impairment.

13.2. Requirements for the Periodic Progress Report

The requirements for periodic reports are outlined in 40 CFR 51.308(g). Each state must submit a report to EPA every five years evaluating the progress towards the reasonable progress goal for each Class I area located within the state and in each Class I area located outside the state which may be affected by emissions from within the state.

EPA's revised Regional Haze Rule no longer requires the progress report to be a formal SIP submittal. At a minimum, the progress report must cover the first year not covered by the previously submitted progress report through the most recent year of data available prior to submission. Florida's previous progress report included data through the year 2013. Therefore, this progress report covers years since 2013. For the purposes of this periodic review (included as part of this regional haze plan revision), the most recent data available are used to highlight the progress made. This review includes NEI data through 2017, visibility data through 2018, and stationary source data through 2019. Section 51.308(f)(5) of the Regional Haze Rule requires that this regional haze plan revision address the progress report requirements of paragraphs 51.308(g)(1) through (5):

(1) A description of the status of implementation of all measures included in the SIP for achieving reasonable progress goals for Class I areas both within and outside the State.

(2) A summary of the emission reductions achieved throughout the State through implementation of the measures described in (1) above.

(3) For each Class I area within the State, the State must assess the following visibility conditions and changes, with values for most impaired and least impaired days expressed in terms of five-year averages of these annual values:

    (i) The current visibility conditions for the most impaired and least impaired days;

    (ii) The difference between current visibility conditions for the most impaired and least impaired days and baseline visibility conditions;

    (iii) The change in visibility impairment for the most impaired and least impaired days over the past five years;

(4) An analysis tracking the change over the past five years in emissions of pollutants contributing to visibility impairment from all sources and activities within the state. Emissions changes should be identified by type of source or activity. The analysis must be based on the most recently updated emissions inventory, with estimates projected forward as necessary and appropriate, to account for emissions changes during the applicable five-year period.

(5) An assessment of any significant changes in anthropogenic emissions within or outside the State that have occurred over the past five years that have limited or impeded progress in reducing pollutant emissions and improving visibility.

13.3. Status of Implementation of Control Measures

This section provides the status of implementation of the emission reduction measures that were included in the original regional haze SIP starting in the year 2014 to 2019, as required by 40 CFR 51.308(g)(1). These measures include Federal programs, State requirements for EGUs, and State requirements for non-EGU point sources. As required by 40 CFR 51.308(g)(2), Florida has estimated the SO_2 emissions reductions achieved through 2019 from measures implemented by the state.

This section also describes other strategies that were not included in the regional haze SIP. At the time of the best and final inventory development process, these measures were not fully documented or had not yet been published in final form, and therefore the benefits of these measures were not included in the 2018 inventory. Emission reductions from these measures have helped each Class I area meet the RPG set in the regional haze SIP for 2018.

13.3.1. Emissions Reduction Measures Included in the Regional Haze SIP

Florida's regional haze SIP included the following types of measures for achieving reasonable progress goals:

- Federal programs and
- State reasonable progress and BART control measures

These emissions reduction strategies were included as inputs to the VISTAS modeling. The current status of the implementation of these measures is summarized in the following paragraphs and an estimate of the SO_2 emissions reductions achieved is presented.

13.3.1.1. Federal and Other State Programs

The emissions reductions associated with the Federal and other state programs that are described in the following paragraphs were included in the VISTAS future year emissions estimates for the first planning period. Descriptions contain qualitative assessments of emissions reductions associated with each program, and where possible, quantitative assessments. In cases where delays or modification have altered emissions reduction estimates such that the original estimates of emissions are no longer accurate, information is also provided on the effects of these alterations.

13.3.1.1.1. Clean Air Interstate Rule

On May 12, 2005, EPA promulgated CAIR, which required reductions in emissions of NO_X and SO_2 from large EGUs fired by fossil fuels. Due to court rulings, CAIR was remanded to EPA to revise elements that were deemed unacceptable and was ultimately replaced by CSAPR. This was later updated through the CSAPR Update rule.

However, at the time that the states were developing their regional haze plans, challenges to CSAPR had left CAIR in place until residual issues were decided by the D.C. Circuit and EPA had resolved implementation issues. Therefore, states included CAIR in the regional haze SIP. The 2018 projected emissions used in the regional haze analysis reflect a modified IPM solution based on the state's best estimate of that year.

Although different than the CAIR solution projected in the regional haze analysis, CSAPR and the CSAPR Update have continued reductions from large EGUs.

13.3.1.1.2. NO_X SIP Call

Phase I of the NO_X SIP Call was included in the regional haze SIP. This applies to certain EGUs and large non-EGUs, including large industrial boilers and turbines, and cement kilns. Those states affected by the NO_X SIP call in the VISTAS region have developed rules for the control of NO_X emissions that have been approved by the EPA. The NO_X SIP Call has resulted in a significant reduction in NO_X emissions from large stationary combustion sources. For the first regional haze SIP, the emissions for NO_X SIP Call-affected sources were capped at 2007 levels and carried forward to the 2009 and 2018 inventories.

13.3.1.1.3. Consent Agreements (TECO, VEPCO) and Gulf Power Crist 7 Voluntary Agreement

Under a settlement agreement, Tampa Electric Company (TECO) converted units at the TECO Gannon Station Power Plant (now TECO Bayside Power Station) from coal to natural gas and installed permanent emissions-control equipment to meet stringent pollution limits.

Under a settlement agreement, Virginia Electric and Power Company (VEPCO) agreed to spend \$1.2 billion by 2013 to eliminate 237,000 tons of SO_2 and NO_X emissions each year from eight coal-fired electricity generating plants in Virginia and West Virginia.

Under a 2002 voluntary agreement, Gulf Power upgraded its operation to significantly cut NO_X emissions at its Crist generating plant.

13.3.1.1.4. One-hour Ozone SIPs (Atlanta/Birmingham/Northern Kentucky)

The regional haze SIP also included emissions reductions from one-hour ozone SIPs submitted to EPA to demonstrate attainment of the one-hour ozone NAAQS. These SIPs require NO_X reductions from specific coal-fired power plants and address transportation plans in these cities. These reductions further improve regional visibility.

13.3.1.1.5. NO_X RACT in 8-hour Nonattainment Area SIPs

The NCDAQ's SIP for the Charlotte / Rock Hill / Gastonia nonattainment area includes RACT for NO_X for two facilities located in the nonattainment area: Philip Morris USA and Norandal USA. These controls were also modeled for 2018. Additional RACT controls may be realized as other companies subject to RACT complete the determination, but RACT-level controls were assumed for just these two sources. These controls further improve regional visibility.

13.3.1.1.6. 2007 Heavy-Duty Highway Rule (40 CFR Part 86, Subpart P)

In this regulation, EPA set a PM emissions standard for new heavy-duty engines of 0.01 g/bhp-hr, which took full effect for diesel engines in the 2007 model year. This rule also included standards for NO_X and non-methane hydrocarbons (NMHC) of 0.20 g/bhp-hr and 0.14 g/bhp-hr, respectively. These diesel engine NO_X and NMHC standards were successfully phased in together between 2007 and 2010. The rule also required that sulfur in diesel fuel be reduced to facilitate the use of modern pollution-control technology on these trucks and buses. EPA required a 97% reduction in the sulfur content of highway diesel fuel, from levels of 500 ppm (low sulfur diesel) to 15 ppm (ultra-low sulfur diesel). These requirements were successfully implemented on the timeline in the regulation. This program applies to all areas of the country, including Florida, thus, more directly affecting Florida Class I areas.

13.3.1.1.7. Tier 2 Vehicle and Gasoline Sulfur Program (40 CFR Part 80, Subpart H; Part 85; Part 86)

EPA's Tier 2 fleet averaging program for onroad vehicles, modeled after the California Low Emission Vehicle (LEV) II standards, became effective in the 2005 model year. The Tier 2 program allows manufacturers to produce vehicles with emissions ranging from relatively dirty to very clean, but the mix of vehicles a manufacturer sells each year must have average NO_X emissions below a specified value. Mobile emissions continue to be reduced by this program as motorists replace older, more polluting vehicles with cleaner vehicles. The Tier 2 program applies nationwide, including Florida, and, thus, has a more direct impact on Florida Class I areas.

13.3.1.1.8. Large Spark Ignition and Recreational Vehicle Rule

EPA has adopted new standards for emissions of NO_X, hydrocarbons (HC), and CO from several groups of previously unregulated non-road engines. Included in these are large industrial spark-ignition engines and recreational vehicles. Non-road spark-ignition engines are those powered by gasoline, liquid propane gas, or compressed natural gas rated over 19 kW (25 horsepower). These engines are used in commercial and industrial applications, including forklifts, electric generators, airport baggage transport vehicles, and a variety of farm and construction applications. Non-road recreational vehicles include snowmobiles, off-highway motorcycles, and all-terrain-vehicles. These rules were initially effective in 2004 and were fully phased-in by 2012. These rules apply nationwide, including Florida.

13.3.1.1.9. Non-Road Mobile Diesel Emissions Program (40 CFR Part 89)

EPA adopted standards for emissions of NO_X, HC, and CO from several groups of non-road engines, including industrial spark-ignition engines and recreational non-road vehicles. Industrial spark-ignition engines power commercial and industrial applications and include forklifts, electric generators, airport baggage transport vehicles, and a variety of farm and construction applications. Non-road recreational vehicles include snowmobiles, off-highway motorcycles, and all-terrain vehicles. These rules were initially effective in 2004 and were fully phased-in by 2012. Non-road mobile emissions continue to benefit from this program as motorists replace older, more polluting non-road vehicles with cleaner vehicles.

The non-road diesel rule set standards that reduced emissions by more than 90% from non-road diesel equipment and, beginning in 2007, the rule reduced fuel sulfur levels by 99% from previous levels. The reduction in fuel sulfur levels applied to most non-road diesel fuel in 2010 and applied to fuel used in locomotives and marine vessels in 2012. This is a nationwide program and impacts Florida sources.

13.3.1.1.10. Maximum Achievable Control Technology Programs (40 CFR Part 63)

VISTAS applied controls to future year emissions estimates from various MACT regulations for VOC, SO_2, NO_X, and PM for source categories where controls were installed on or after 2002.

Table 13-3 describes the MACTs used as control strategies for the non-EGU point source emissions in the regional haze SIP. The table notes the pollutants for which controls were applied as well as the promulgation dates and the compliance dates for existing sources.

Table 13-3: MACT Source Categories

MACT Source Category	40CFR63 Subpart	Original Promulgation Date	Compliance Date (Existing Sources)	Pollutants Affected
Hazardous Waste Combustion (Phase I)	63(EEE), 261 and 270	9/30/99	9/30/03	PM
Portland Cement Manufacturing	LLL	6/14/99	6/10/02	PM
Secondary Aluminum Production	RRR	3/23/00	3/24/03	PM
Lime Manufacturing	AAAAA	1/5/04	1/5/07	PM, SO_2
Taconite Iron Ore Processing	RRRRR	10/30/03	10/30/06	PM, SO_2
Industrial Boilers, Institutional/ Commercial Boilers and Process Heaters	DDDDD	9/13/04	9/13/07	PM, SO_2
Reciprocating Internal Combustion Engines	ZZZZ	6/15/04	6/15/07	NO_X, VOC

The Industrial/Commercial/Institutional (ICI) boiler MACT standard (40 CFR Part 63, Subpart DDDDD) was vacated by the U.S. Court of Appeals and remanded the regulation to EPA on June 8, 2007. VISTAS chose, however, to leave the emissions reductions associated with this regulation in place as the CAA required use of alternative control methodologies under Section 112(j) for uncontrolled source categories. The applied MACT control efficiencies were 4% for SO_2 and 40% for PM_{10} and $PM_{2.5}$ to account for the co-benefit from installation of acid gas scrubbers and other control equipment to reduce HAPs.

EPA finalized the revised ICI Boiler MACT on March 21, 2011. EPA subsequently reconsidered certain aspects of the rule and proposed changes on December 2, 2011. The rules were re-promulgated on January 31, 2013. The final compliance date for ICI boilers at major sources was 2016, with the option to request an additional year. EPA's estimate of nationwide SO_2 emissions reductions from this rule is over 500,000 tons/year, as compared to an estimate of 113,000 tons/year in the analysis for the 2004 rule (78 Fed. Reg. 7,138 and 69 Fed. Reg. 55,218). On November 5, 2015, EPA finalized additional revisions to the Boiler MACT and projected that these updates would not significantly change the emissions reductions expected from the rule. It is, therefore, reasonable to conclude that the 2012 rule has brought about more SO_2 reductions in Florida than were modeled in Florida's Regional Haze Plan.

13.3.1.2. State EGU Control Measures

Emissions from EGUs have been regulated through state measures in North Carolina and Georgia, which were included in the regional haze SIP modeling. Reductions associated with these measures were used to estimate the 2018 visibility improvements at the VISTAS Class I areas.

13.3.1.2.1. North Carolina Clean Smokestacks Act

In June of 2002, the North Carolina General Assembly enacted the Clean Smokestacks Act (CSA), which required significant actual emissions reductions from coal-fired power plants in North Carolina. These reductions were included as part of the VISTAS 2018 Best and Final modeling effort. Under the CSA, power plants were required to reduce their NO_X emissions by 77% in 2009 and their SO_2 emission by 73% in 2013. Actions taken to date by facilities subject to these requirements comply with the provisions of the CSA, and compliance plans and schedules will allow these entities to achieve the emissions limitations set out by the Act. This program has been highly successful. In 2009, regulated entities emitted less than the 2013 system annual cap of 250,000 tons of SO_2 and less than the 2009 system annual cap of 56,000 tons of NO_X. In 2002, the sources subject to CSA emitted 459,643 tons of SO_2 and 142,770 tons of NO_X. In 2011, these sources emitted only 73,454 tons of SO_2 and 39,284 tons of NO_X, well below the Act's system caps.

This legislation established annual caps on both SO_2 and NO_X emissions for the two primary utility companies in North Carolina, Duke Energy and Progress Energy. Duke Energy and Progress Energy have produced emissions reductions beyond what was required which further improved regional visibility.

13.3.1.2.2. Georgia Multi-Pollutant Control for Electric Utility Steam Generating Units

Georgia rule 391-3-1.02(2)(sss), enacted in 2007, requires flue-gas desulphurization (FGD) and SCR controls on large coal-fired EGUs in Georgia. Reductions from this regulation were included as part of the VISTAS 2018 Best and Final modeling effort. These controls reduced SO_2 emissions from the affected emissions units by at least 95% and reduced NO_X emissions by approximately 85%. Control implementation dates vary by EGU, starting with December 31, 2008 and ending with December 31, 2015.

13.3.1.3. Florida Reasonable Progress and BART Control Measures

Florida completed source-specific reasonable progress and BART determinations for all applicable sources in the first-round regional haze SIP. In total, Florida had 46 BART-eligible sources 15 reasonable progress sources were reviewed. Of the 46 BART-eligible sources, 25 had met the modeling exemption criteria, nine shut down and twelve were reviewed for BART determinations. Of the 15 facilities with reasonable progress units, three had shut down, three took enforceable permit limits that rendered them no longer subject to a four-factor analysis, six were also BART sources that completed a BART demonstration (equivalent to a reasonable progress determination), and five completed a reasonable progress four-factor analysis determination. (Two sources had units split between BART and reasonable progress.)

Table 13-4 lists the fifteen facilities that had units for which a reasonable progress determination was made and the current status. All facilities that were required to implement reasonable progress controls or measures have met their compliance dates. The table compares the modeled 2018 SO_2 emissions to the actual 2018 emissions for these sources. The 2019 emissions are also available and have been included in the table. The table also includes 2014 emissions and shows the emissions change over the period from 2014 through 2019 (2019 emissions minus 2014 emissions). Since the last progress report, five additional reasonable progress units at three facilities have shutdown, with 15 reasonable progress units still in operation. At of the end of the first implementation period (2018), actual emissions from all existing facilities (23,117 tpy from 10 facilities) are significantly lower than the emissions that were modeled in the SIP for 2018 (133,552 tpy from 13 facilities), including those facilities that made no changes due to no reasonable progress controls being identified. During the 2014 – 2019 period, SO_2 emissions from these units decreased by 60,752 tons per year.

Table 13-5 lists the twelve sources for which a BART review was made. Sources that were exempt from BART analysis or shut down prior to submission of the first regional haze SIP are not listed. All BART controls have been implemented as of December 31, 2018. The actual 2018 and 2019 emissions for these sources are compared to the emission reductions that were expected based upon the BART emission limitations compared to the 2002 base year emissions. As of the end of the first implementation period (2018), reductions in actual emissions from existing facilities (7,259 tpy SO_2, 9,238 tpy NO_X, and 285 tpy PM from eight facilities) have significantly surpassed the emission reductions expected from the 2002 base year emissions based on BART emission limitations. This is due to additional unit shutdowns and fuel switches, documented in the table, that occurred for reasons outside the BART process. The table also shows 2014 emissions and the emissions change over the period from 2014 through 2019 (2019 emissions minus 2014 emissions). During the 2014 – 2019 period, SO_2 emissions from these units decreased by 43,416 tons per year, NO_X emissions decreased by 10,073 tons per year, and PM emissions decreased by 1,742 tons per year.

Table 13-4: Current Status of Reasonable Progress Sources from the First Implementation Period

Plant Name	Unit ID	Current Status of Controls/Reductions	Met Compliance Date?	BART-Eligible?	Actual 2014 SO_2 Emissions	Modeled 2018 SO_2 Emissions	Actual 2018 SO_2 Emissions	Actual 2019 SO_2 Emissions	Emissions Change 2019 - 2014
GRU Deerhaven	EU005	Permit limited (5,500 tpy)	Y		1,134.2	1,062	513.4	593.6	-540.6
FPL Port Everglades	EU003	Shutdown 01/31/13	Y	Y	-	859	-	-	-
FPL Port Everglades	EU004	Shutdown 01/31/13	Y	Y	-	97	-	-	-
Duke Crystal River	EU001	Shutdown 12/31/18	Y	Y	11,152	13,537	456.9	-	-11,152
Duke Crystal River	EU002	Shutdown 12/31/18	Y	Y	14,660	15,241	3,787.0	-	-14,660
Duke Crystal River	EU003	FGD – in operation	N/A		3,286	3,634	3,364.8	1,189.7	-2,096.3
Duke Crystal River	EU004	FGD – in operation	N/A		3,447	6,120	3,364.8	1,990.2	-1,456.8
FPL Turkey Point	EU001	Shutdown 10/31/16	Y	Y	98.5	499	-	-	-98.5
FPL Turkey Point	EU002	Shutdown 10/31/16	Y	Y	-	179	-	-	-
JEA St. Johns River Power Park	EU016	Shutdown	N/A		10,638.6	5,882	-	-	-10,638.6
JEA St. Johns River Power Park	EU017	Shutdown	N/A		7,821	7,420	-	-	-7,821
JEA Northside	EU027	Permit limited (1,816 tpy)	Y		1,283	5,950	1,525.4	1,601.0	318
JEA Northside	EU003	No changes	N/A	Y	109.1	7,146	223.4	23.7	-85.4
Gulf Clean Energy Center (Crist)	EU007	FGD – in operation	N/A	Y	1,480.9	4,648	430.6	889.5	-591.4
Florida Power Development	EU018	Shutdown 06/30/18	Y		45.8	2,884	2.0	-	-45.8
TECO Bayside (formerly Gannon)	EU001	Shutdown 2003	Y		-	0	-	-	-
TECO Bayside (formerly Gannon)	EU002	Shutdown 2003	Y		-	0	-	-	-
TECO Bayside (formerly Gannon)	EU003	Shutdown 2003	Y		-	0	-	-	-
TECO Bayside (formerly Gannon)	EU004	Shutdown 2003	Y		-	0	-	-	-
TECO Bayside (formerly Gannon)	EU005	Shutdown 2003	Y		-	0	-	-	-
TECO Bayside (formerly Gannon)	EU006	Shutdown 2003	Y		-	0	-	-	-
FPL Manatee	EU001	Fuel oil sulfur reduction – in effect	Y	Y	221.3	4,371	271.1	209.9	-11.4
FPL Manatee	EU002	Fuel oil sulfur reduction – in effect	Y	Y	219.5	6,163	238.3	200.0	-19.5
WestRock Fernandina Beach	EU015	No changes	N/A		3,022.9	3,627	1,641.1	932.8	-2,090.1
Duke Anclote	EU001	Converted to NG only – in effect	Y	Y	3.8	13,879	4.8	3.2	-0.6
Duke Anclote	EU002	Converted to NG only – in effect	Y	Y	4.2	13,225	4.0	4.4	0.2
Duke Bartow	EU001	Shutdown 2009	Y		-	0	-	-	-
Duke Bartow	EU002	Shutdown 2009	Y		-	0	-	-	-
Duke Bartow	EU003	Shutdown 2009	Y	Y	-	0	-	-	-
Lakeland McIntosh	EU006	Eliminated petcoke – in effect	Y		2,152.1	3,842	1,651.4	843.5	-1,308.6
Seminole Electric	EU001	FGD improved to 0.25 lb/mmbtu/ no petcoke	Y		6,704.9	6,779	2,970.0	2,264.0	-4,440.9
Seminole Electric	EU002	FGD improved to 0.25 lb/mmbtu/ no petcoke	Y		6,311.7	6,508	2,668.0	2,299.4	-4012.3
				Total:	73,797	133,552	23,117	13,045	-60,752

Table 13-5: Current Status of BART Sources

Plant Name	Unit ID	Current Status of Controls/Reductions	Met Compliance Date?	2002 SO_2	2014 SO_2	Est. SO_2 Reduction 2018	Actual 2018 SO_2	Actual 2019 SO_2	2019 – 2014 SO_2 Change	2002 NO_X	2014 NO_X	Est. NO_X Reduction 2018	Actual 2018 NO_X	Actual 2019 NO_X	2019 – 2014 NO_X Change	2002 PM	2014 PM	Est. PM Reduction 2018	Actual 2018 PM	Actual 2019 PM	2019 – 2014 PM Change
GULF LANSING SMITH	1	SO_2 -DSI (0.74 lb/MMBtu) approx. 50% reduction, required by 3/31/16. Unit retired 3/31/16	Y	6,044	3,982.9	3,022	-	-	-3,982.9	2,533	1,246.5	0	-	-	-1,246.5	79	100.4	0	-	-	-100.4
GULF LANSING SMITH	2	SO_2 -DSI (0.74 lb/MMBtu) approx. 50% reduction, required by 3/31/16. Unit retired 3/31/16	Y	4,247	2,549.4	2.123	-	-	-2,549.4	1,428	797.8	0	-	-	-7977.8	55	63.4	0	-	-	-63.4
DUKE CRYSTAL RIVER	1	By permit, unit will cease coal operation by 12/31/20 – Unit retired 12/31/18	Y	18,998	11,152	0	456.9	-	-11,152	4,810	2,790	0	231.4	-	-2,790	179	446.9	0	7.0	-	-446.9
DUKE CRYSTAL RIVER	2	By permit, unit will cease coal operation by 12/31/20 – Unit retired 12/31/18	Y	20,728	14,660	0	3,787.0	-	-14,660	6,373	3,577	0	2,070.7	-	-3,577	74	195.2	0	69.6	-	-195.2
GULF CRIST	6	No changes	N/A	11,085	1,081.5	0	270.4	238.5	-843	3,518	845.1	0	624.4	372.4	-472.7	108	209.5	0	34.8	11.8	-197.7
GULF CRIST	7	No changes	N/A	21,546	1,480.9	0	430.6	889.5	-591.4	6,355	1,157.3	0	994.4	1,389.2	-231.9	191	301.1	0	55.4	44.0	-257.1
TECO BIG BEND	1	No changes. Fires natural gas only.	N/A	2,789	2,891.9	0	3.2	0.7	-2,891.2	9,142	1,258.4	0	196.2	295.8	-962.6	200	195.9	0	2.5	3.1	-192.8
TECO BIG BEND	2	No changes. Fires natural gas only.	N/A	2,021	2,634.8	0	4.1	1.0	-2,633.8	6,625	1,146.5	0	217.1	397.4	-749.1	718	158.8	0	2.9	3.4	-155.4
TECO BIG BEND	3	No changes	N/A	2,621	2,609.9	0	1,070.7	47.9	-2,562	5,929	1,469.9	0	931.4	617.5	-852.4	402	44.0	0	33.6	19.4	-24.6
JEA NORTHSIDE/SJRPP	3	No changes	N/A	7,146	109.1	0	223.4	23.7	-85.4	3,631	325.3	0	1,852.6	1,956.5	1,631.2	568	6.1	0	22.0	17.3	11.2
FPL MANATEE	1	SO_2 - lower S limit (0.7% or less) approx. 30% reduction- in effect	Y	14,691	221.3	4,407	271.1	209.9	-11.4	4,630	174.4	0	305.5	368.1	193.7	1,177	34.9	0	8.6	13.8	-21.1
FPL MANATEE	2	SO_2 - lower S limit (0.7% or less) approx. 30% reduction- in effect	Y	16,508	219.5	4,952	238.3	200.0	-19.5	5,210	180.0	0	266.1	388.8	208.8	1,323	32.2	0	7.0	11.8	-20.4
LAKELAND C.D. MCINTOSH	1	Shutdown	Y	559	0	0	-	-	-	246	0.9	0	-	-	-0.9	22	0.01	0	-	-	-0.01
LAKELAND C.D. MCINTOSH	5	Shutdown 06/22/20	N/A	80	3.3	0	4.5	4.6	1.3	168	119.3	0	184.8	190.5	71.2	8	11.6	0	15.2	15.5	3.9
FPL MARTIN	1	Shutdown 12/31/18	N/A	6,404	683.7	0	248.1	-	-683.7	2,434	586.1	0	614.3	-	-586.1	576	57.3	0	10.3	-	-57.3
FPL MARTIN	2	Shutdown 12/31/18	N/A	8,215	24.4	0	250.2	-	-24.4	2,937	74.0	0	742.1	-	-74.0	730	2.1	0	10.0	-	-2.1
FPL TURKEY POINT	1	Shutdown 10/31/16	Y	4,307	98.5	3,808	-	-	-98.5	2,324	297.9	0	-	-	-297.9	369	13.1	0	-	-	-13.1
FPL TURKEY POINT	2	Shutdown 10/31/16	Y	4,289	-	4,289	-	-	-	2,233	-	2,233	-	-	-	365	-	365	-	-	-
TALLAHASSEE PURDOM	7	Shutdown 12/31/13	Y	2	-	2	-	-	-	11	-	11	-	-	-	0.3	-	3	-	-	-
PCS White Springs	1	Shutdown	N/A	0	-	0	-	-	-	0	-	0	-	-	-	17	-	0	-	-	-
PCS White Springs	3	Shutdown	N/A	1	-	0	-	-	-	29	-	0	-	-	-	11	-	0	-	-	-
PCS White Springs	4	No changes	N/A	23	-	0	-	-	-	12	-	0	-	-	-	10	-	0	-	-	-
PCS White Springs	8	No changes	N/A	1	20.7	0	-	0.0074	-20.7	0	3.0	0	-	2.153	-0.8	0	13.2	0	-	4.708	-8.5
PCS White Springs	10	No changes	N/A	0	-	0	-	-	-	0	-	0	-	-	-	12	0.1	0	-	0.0016	-0.098
PCS White Springs	15	No changes	N/A	0	-	0	-	-	-	0	-	0	-	-	-	5	0.5	0	0.407	0.133	-0.4
PCS White Springs	21	Shutdown	N/A	18	328.1	0	-	-	-328.1	Limited operation	-	0	-	-	-	0	-	0	-	-	-
PCS White Springs	22	Shutdown	N/A	27	270.1	0	-	-	-270.1	Limited operation	-	0	-	-	-	0	-	0	-	-	-
PCS White Springs	32	No changes	N/A	0	9.5	0	0.0246	0.0081	-9.4	1	4.3	0	7.175	2.357	-1.9	0	2.5	0	5.409	2.176	-0.3
PCS White Springs	38	Shutdown	N/A	1	-	0	-	-	-	29	-	0	-	-	-	14	-	0	-	-	-
PCS White Springs	42	Shutdown	N/A	13	-	0	-	-	-	7	-	0	-	-	-	1	-	0	-	-	-
PCS White Springs	44	Shutdown	N/A	0	-	0	-	-	-	0	-	0	-	-	-	16	-	0	-	-	-
PCS White Springs	54	No changes	N/A	Active	-	0	-	-	-	Active	-	0	-	-	-	Active	-	0	-	-	-

Plant Name	Unit ID	Current Status of Controls/Reductions	Met Compliance Date?	2002 SO_2	2014 SO_2	Est. SO_2 Reduction 2018	Actual 2018 SO_2	Actual 2019 SO_2	2019 – 2014 SO_2 Change	2002 NO_X	2014 NO_X	Est. NO_X Reduction 2018	Actual 2018 NO_X	Actual 2019 NO_X	2019 – 2014 NO_X Change	2002 PM	2014 PM	Est. PM Reduction 2018	Actual 2018 PM	Actual 2019 PM	2019 – 2014 PM Change
PCS White Springs	62	Shutdown	N/A	Active	-	0	-	-	-	Active	-	0	-	-	-	Active	-	0	-	-	-
PCS White Springs	64	Shutdown	N/A	0	-	0	-	-	-	2	-	0	-	-	-	1	-	0	-	-	-
PCS White Springs	65	Shutdown	N/A	0	-	0	-	-	-	0	-	0	-	-	-	0	-	0	-	-	-
CEMEX Brooksville	2	No changes	N/A	0	-	0	-	-	-	0	-	0	-	-	-	3	-	0	-	-	-
CEMEX Brooksville	3	No changes	N/A	5	-	0	-	-	-	555	-	0	-	-	-	16	-	0	-	-	-
CEMEX Brooksville	4	No changes	N/A	0	-	0	-	-	-	0	-	0	-	-	-	11	-	0	-	-	-
CEMEX Brooksville	5	No changes	N/A	0	-	0	-	-	-	0	-	0	-	-	-	105	-	0	-	-	-
CEMEX Brooksville	6	No changes	N/A	0	-	0	-	-	-	0	-	0	-	-	-	1	-	0	-	-	-
CEMEX Brooksville	8	No changes	N/A	0	-	0	-	-	-	0	-	0	-	-	-	6	-	0	-	-	-
CEMEX Brooksville	9	No changes	N/A	0	-	0	-	-	-	0	-	0	-	-	-	105	-	0	-	-	-
CEMEX Brooksville	11	No changes	N/A	0	-	0	-	-	-	0	-	0	-	-	-	8	-	0	-	-	-
			Totals:	152,369	45,032	22,603	7,259	1,616	-43,416	71,172	16,054	2,244	9,238	5,981	-10,073	7.482	1,889	368	285	147	-1,742

13.3.2. Emission Reduction Measures Not Included in the Regional Haze SIP

A number of regulations and requirements have been promulgated that were not included in Florida's original SIP submittal. These measures provided additional emission reductions to allow VISTAS Class I areas to meet their reasonable progress goals.

- The International Maritime Organization has strengthened the standards for sulfur in marine fuel (discussed in Section 7.2.1.4.4).
- New source performance standards (NSPS) for stationary compression ignition internal combustion engines and stationary spark ignition internal combustion engines, contained in 40 CFR Part 60, Subparts IIII and JJJJ, respectively, have generated a significant decrease in NO_X emissions from these sources.
- EPA's Mercury and Air Toxics Standards (discussed in Section 7.2.1.2) and the 2010 SO_2 NAAQS (discussed in Section 7.2.1.3) have further reduced emissions from EGUs.

13.4. Visibility Conditions

40 CFR 51.308(g)(3) requires the state to assess the visibility conditions for the most impaired and least impaired days expressed in terms of five-year averages. The visibility conditions that must be reviewed include: (1) the current visibility conditions; (2) the difference between current visibility conditions compared to the baseline; and (3) the change in visibility impairment for the most and least impaired days over the past five years.

Table 13-6 and Table 13-7 show the current visibility conditions and the difference between the current visibility and the baseline condition expressed in terms of five-year averages of observed visibility impairment for the 20% worst days and the 20% clearest days, respectively. The baseline conditions are for 2000 through 2004 and the current conditions are for 2014 through 2018. Because the RPGs in the first planning period were calculated for the 20% worst days, the table includes a comparison of the baseline average and current average for the 20% worst days. Table 2-6 shows the current visibility conditions and the difference between the current visibility and the baseline condition for the 20% most impaired days.

The data shows that all Class I areas saw an improvement in visibility on the 20% worst days, the 20% most impaired days, and on the 20% clearest days. The current observed 5-year average values for all three areas on the 20% worst days are below the 2018 goal. On the 20% clearest days, the current observed 5-year average values for all three areas are below the 2018 goal of no degradation.

Table 13-6: Current Observed Visibility Impairment, Change from Baseline, and Comparison to 2018 RPGs, 20% Worst Days

Class I Area	Baseline Average (2000-2004)	Current Average (2014-2018)	Change, current – baseline	2018 Goal	Difference, current – goal
Chassahowitzka	25.75 dv	19.58 dv	-6.17 dv	22.27 dv	-2.69 dv
Everglades	22.30 dv	17.74 dv	-4.56 dv	19.80 dv	-2.06 dv
St. Marks	26.31 dv	20.09 dv	-6.22 dv	22.92 dv	-2.83 dv

Table 13-7: Current Observed Visibility Impairment, Change from Baseline, and Comparison to 2018 RPGs, 20% Clearest Days

Class I Area	Baseline Average (2000-2004)	Current Average (2014-2018)	Change, current – baseline	2018 Goal	Difference, current – goal
Chassahowitzka	15.60 dv	12.41 dv	-3.19 dv	<15.60 dv	-3.19 dv
Everglades	11.69 dv	10.37 dv	-1.32 dv	<11.69 dv	-1.32 dv
St. Marks	14.34 dv	11.15 dv	-3.19 dv	<14.34 dv	-3.19 dv

The previous progress report covered visibility through 2013. Table 13-8 through Table 13-10 display the change in visibility impairment for the 20% worst days, 20% most impaired days, and 20% clearest days since 2013 through 2018. The data shows that all three Class I areas saw an improvement in visibility on the 20% worst, 20% most impaired, and 20% clearest days.

Table 13-8: Observed Visibility Impairment for Five-Year Periods Through 2018, 20% Worst Days

Class I Area	2010-2014	2011-2015	2012-2016	2013-2017	2014-2018
Chassahowitzka	21.17 dv	20.66 dv	19.97 dv	19.88 dv	19.58 dv
Everglades	17.86 dv	17.69 dv	18.12 dv	17.98 dv	17.74 dv
St. Marks	21.82 dv	21.11 dv	20.68 dv	20.42 dv	20.09 dv

Table 13-9: Observed Visibility Impairment for Five-Year Periods Through 2018, 20% Most Impaired Days

Class I Area	2010-2014	2011-2015	2012-2016	2013-2017	2014-2018
Chassahowitzka	19.56 dv	19.00 dv	18.19 dv	17.77 dv	17.41 dv
Everglades	16.05 dv	15.72 dv	15.28 dv	14.99 dv	14.90 dv
St. Marks	19.72 dv	18.99 dv	18.15 dv	17.69 dv	17.39 dv

Table 13-10: Observed Visibility Impairment for Five-Year Periods Through 2018, 20% Clearest Days

Class I Area	2010-2014	2011-2015	2012-2016	2013-2017	2014-2018
Chassahowitzka	13.55 dv	13.29 dv	12.89 dv	12.64 dv	12.46 dv
Everglades	11.12 dv	10.94 dv	10.62 dv	10.36 dv	10.37 dv
St. Marks	12.95 dv	12.21 dv	11.87 dv	11.51 dv	11.19 dv

Figure 13-4 through Figure 13-9 display the data listed in Table 13-6 through Table 13-10 for the 20% worst days, 20% most impaired days, and the 20% clearest days, as well as the URP towards natural background for the 20% worst days. The URP and 2018 RPGs in the first implementation period were based on the 20% worst days; therefore, the figures below continue to look at the 20% worst days. Figure 7-9 through Figure 7-11 show the URP and observed visibility impairment for the 20% most impaired days.

Figure 13-4, Figure 13-5, and Figure 13-6 show the observed five-year average impairment values for the 20% worst days in Chassahowitzka, Everglades, and St. Marks, as well as the associated glide slope and the predicted impairment from the regional haze SIP. The 2018 RPG is included in each graph. The observed five-year average impairment for 2018 is well below both the glide path and the predicted impairment for all three Class I areas.

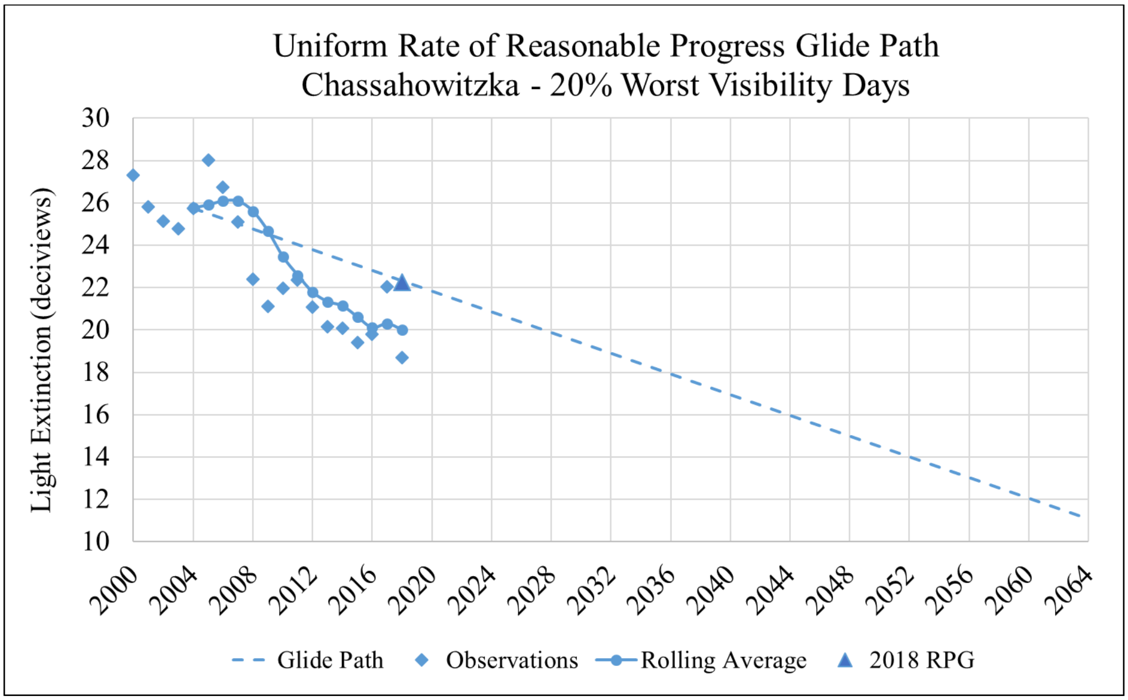

Figure 13-4: Chassahowitzka Visibility Impairment on the 20% Worst Visibility Days, Glide Path, and 2018 RPG

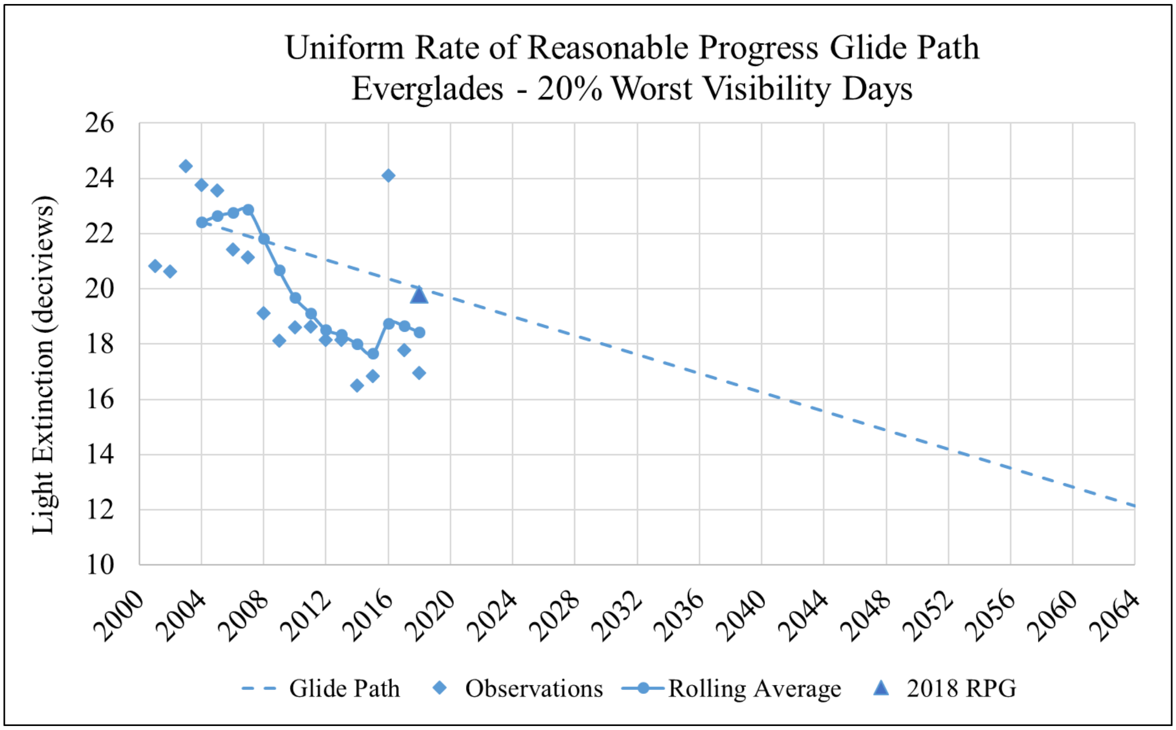

Figure 13-5: Everglades Visibility Impairment on the 20% Worst Visibility Days, Glide Path, and 2018 RPG

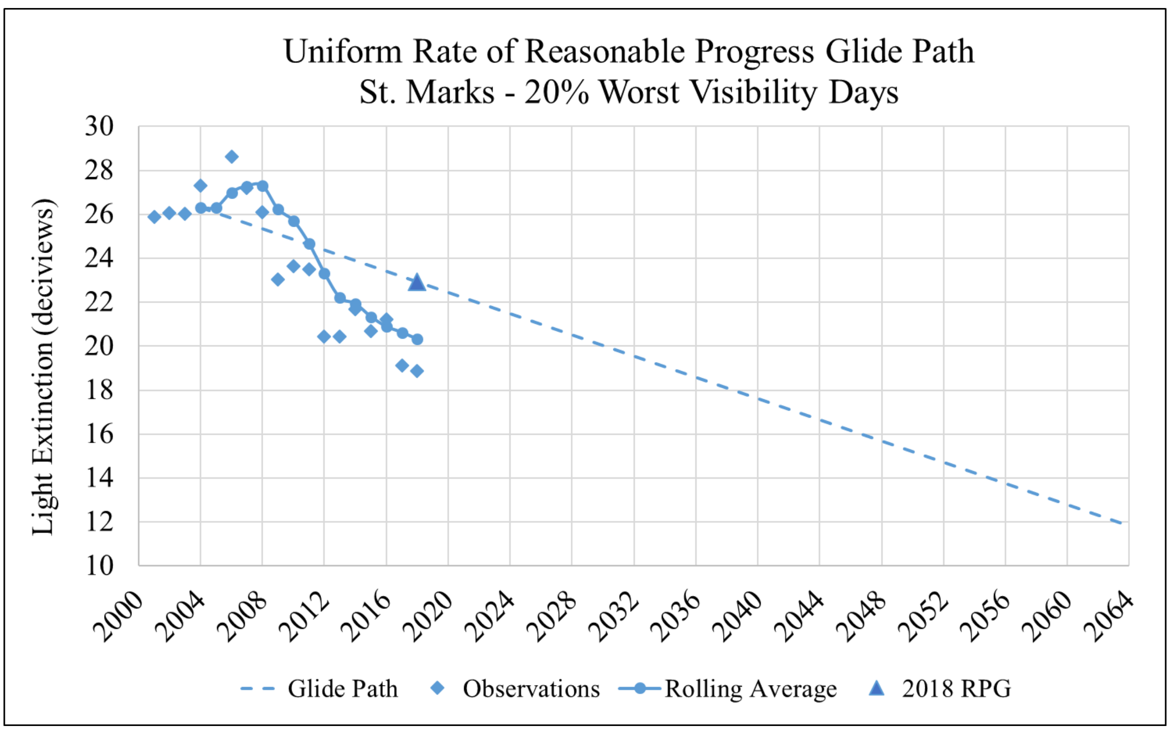

Figure 13-6: St. Marks Visibility Impairment on the 20% Worst Visibility Days, Glide Path, and 2018 RPG

Figure 13-7, Figure 13-8, and Figure 13-9 show the observed five-year average impairment values for the 20% clearest days in Chassahowitzka, Everglades, and St. Marks, as well as the predicted impairment from the regional haze SIP. The observed five-year average impairment for the 20% clearest days of 2018 is below both the baseline and the predicted impairment for each Class I area.

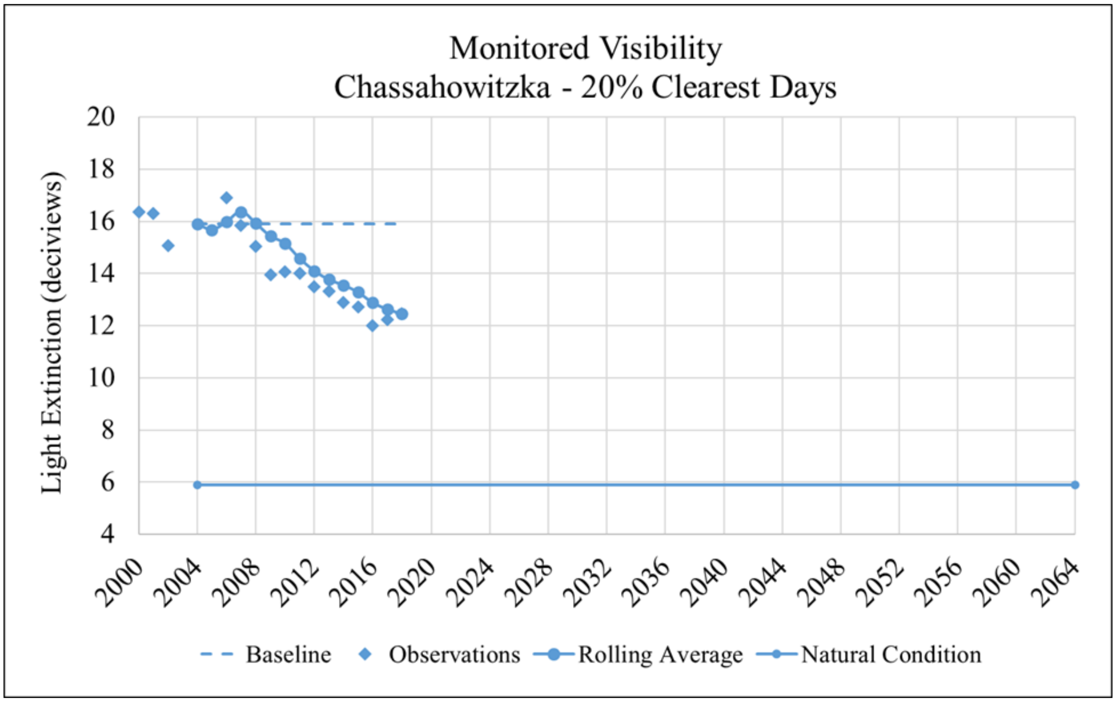

Figure 13-7: Chassahowitzka Visibility Impairment on the 20% Clearest Days and Natural Conditions

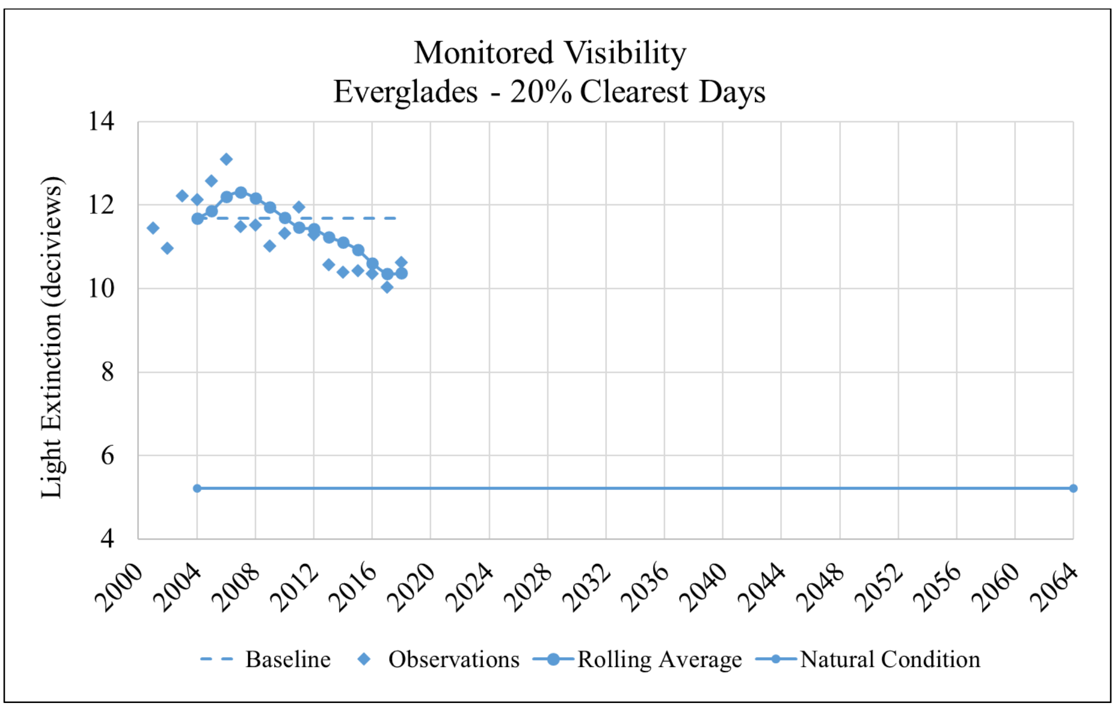

Figure 13-8: Everglades Visibility Impairment on the 20% Clearest Days and Natural Conditions

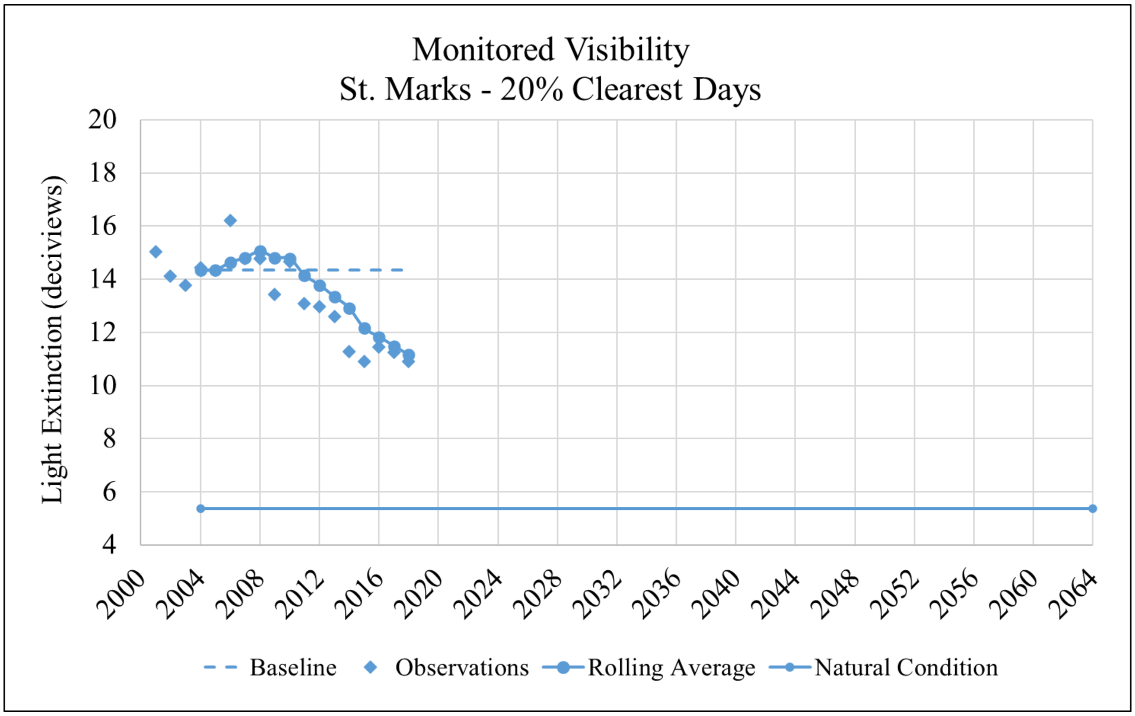

Figure 13-9: St. Marks Visibility Impairment on the 20% Clearest Days and Natural Conditions

13.5. Emissions Analysis

This section includes an analysis tracking the change since 2013 in emissions of pollutants contributing to visibility impairment from all sources and activities within the state, as required by 40 CFR 51.308(g)(4). Because SO_2 was the significant pollutant contributing to visibility impairment during the first implementation period, the emissions analysis will focus mostly on SO_2 emissions. This section also includes an assessment of changes in anthropogenic emissions since 2013, as required by 40 CFR 51.308(g)(5).

13.5.1. Change in $PM_{2.5}$, NO_X, SO_2, Emissions from All Source Categories

There are six emissions inventory source categories: stationary point, area (non-point), non-road mobile, onroad mobile, fires, and biogenic sources.

- Stationary point sources are those sources that emit greater than a specified tonnage per year, with data provided at the facility level. Electricity generating utilities and industrial sources are the major categories for stationary point sources.
- Stationary area sources are those sources whose individual emissions are relatively small, but due to the large number of these sources, the collective emissions from the source category could be significant. These types of emissions are estimated on a countywide level.

- Non-road mobile sources are equipment that can move, but do not use the roadways (i.e., lawn mowers, construction equipment, marine vessels, railroad locomotives, aircraft). The emissions from these sources, like stationary area sources, are estimated on a countywide level.

- Onroad mobile sources are automobiles, trucks, and motorcycles that use the roadway system. The emissions from these sources are estimated by vehicle type and road type and are summed to the countywide level.

- Fire emissions include prescribed fire and wildfire emissions and can be summed to a countywide level or reported as a point source.

- Biogenic sources are natural sources like trees, crops, grasses and natural decay of plants. The biogenic emissions are not included in this review since they were held constant as part of the original regional haze SIP modeling and are not controllable emissions.

For the purpose of evaluating recent emissions changes and progress, Florida used the 2014 NEI, the 2017 NEI, and the state Annual Operating Report point source data collected each year. When available, data after 2017 is also used. For comparison purposes, the tables below include the 2018 emissions projected by VISTAS in the first regional haze SIP.

Table 13-11 shows how $PM_{2.5}$ emissions for each source category have changed. The table also includes the VISTAS 2018 emissions projections developed in the first planning period for comparison. Compared to the VISTAS 2018 emissions projections, $PM_{2.5}$ emissions were higher in the 2017 NEI for the onroad and area source categories. However, the overall $PM_{2.5}$ emissions across all categories in the 2017 NEI are 20% lower than what VISTAS projected for 2018.

Table 13-11: $PM_{2.5}$ Emissions (tons) for the 2014 NEI, 2017 NEI, and 2018 VISTAS Inventories

$PM_{2.5}$ Sector	NEI 2014 (tpy)	NEI 2017 (tpy)	VISTAS 2018G4 (tpy)
Point	20,936	16,799	48,903
Area	127,353	78,308	72,454
Onroad	8,991	6,723	4,038
Non-Road	8,254	6,312	11,868
Fires	97,306	72,494	88,756
Total	**262,839**	**180,635**	**226,019**

For NO_X emissions (Table 13-12), there have been significant decreases in each source category. The 2017 NEI emissions for area and onroad categories are higher than the 2018 projected emissions. However, the overall NO_X emissions from all categories for 2017 are approximately 12% lower than the 2018 projections.

Table 13-12: NO_X Emissions (tons) for the 2014 NEI, 2017 NEI, and 2018 VISTAS Inventories

NO_X Sector	NEI 2014 (tpy)	NEI 2017 (tpy)	VISTAS 2018G4 (tpy)
Point	118,657	102,203	140,604
Area	78,803	31,579	30,708
Onroad	262,347	201,751	150,180
Non-Road	84,375	64,589	127,885
Fires	23,665	14,247	19,791
Total	**567,847**	**414,369**	**469,168**

For SO_2 emissions (Table 13-13), point sources show the most significant decrease since 2014, and actual emissions from point sources are already 75% lower than the projected 2018 emissions. This is largely due to a significant reduction in oil use and shift to natural gas as well as installation of control measures from EPA rules such as MATS and the Data Requirements Rule. Overall, SO_2 emissions across all categories for 2017 are 75% below the 2018 projections.

Table 13-13: SO_2 Emissions (tons) for the 2014 NEI, 2017 NEI, and 2018 VISTAS Inventories

SO_2 Sector	NEI 2014 (tpy)	NEI 2017 (tpy)	VISTAS 2018G4 (tpy)
Point	133,650	66,538	265,838
Area	17,712	2,358	38,317
Onroad	2,158	2,049	2,533
Non-Road	215	153	7,536
Fires	10,734	7,075	4,129
Total	**164,468**	**78,173**	**318,353**

Actual emissions reductions from the EGU sector have continued to decrease significantly due to installation of scrubbers and other controls on some of the larger power generation sources in Florida. Repowering or shifting to natural gas, as well as some reduced utilization of coal EGUs and increased utilization of natural gas EGUs and renewable energy has also significantly reduced emissions of SO_2. Table 13-14 shows the CAMD emissions from 2014 to 2019.

Table 13-14: Florida EGU SO_2 Emissions for CAMD (2014-2019)

SO_2 Emissions	2014 (tpy)	2015 (tpy)	2016 (tpy)	2017 (tpy)	2018 (tpy)	2019 (tpy)
CAMD	99,073.98	61,395.59	39,186.36	35,699.88	29,201.51	17,075.10

Figure 13-10 below depicts the trends for units that report annual emissions to CAMD and are located in Florida. Since 2014, heat input has remained fairly steady with a decrease of about 5% over this period.

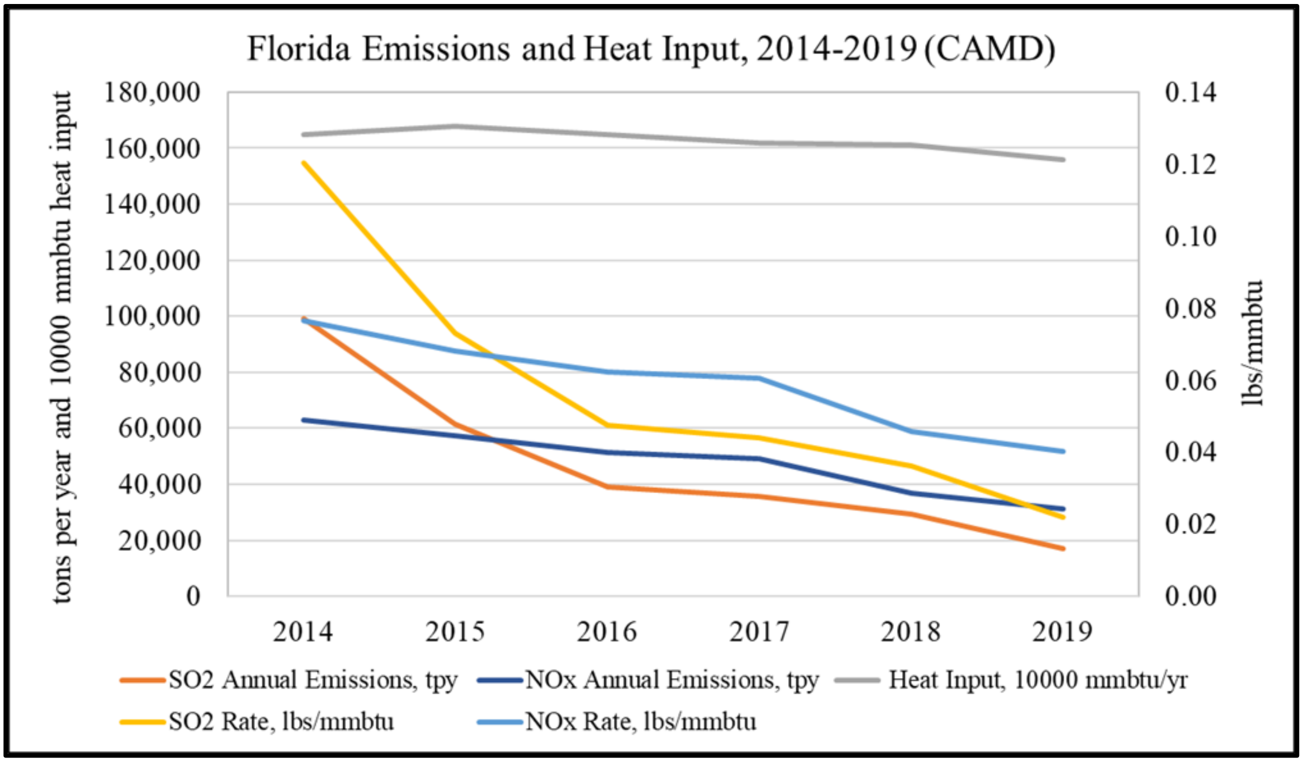

Figure 13-10: Florida CAMD Emissions and Heat Input Data ***(Source: EPA CAMD Database)***

The SO_2 emissions from these units decreased from 99,074 tons annually in 2014 to 17,075 tons annually in 2019, a decrease of 83%. The average SO_2 emission rate from these units decreased from 0.120 lbs/mmbtu in 2014 to 0.022 lbs/mmbtu in 2019, a decrease of 82%. The reductions in emissions are not attributable to reduced demand for power. Instead, the significant emission reductions are attributable to the overall emissions rate decrease that is due to the installation of controls and the use of cleaner burning fuels. Over the same period, NO_X emissions decreased from 62,984 tpy to 31,251 tpy, a drop of 50%.

Figure 13-11 shows the trends for units reporting to CAMD across all VISTAS states.

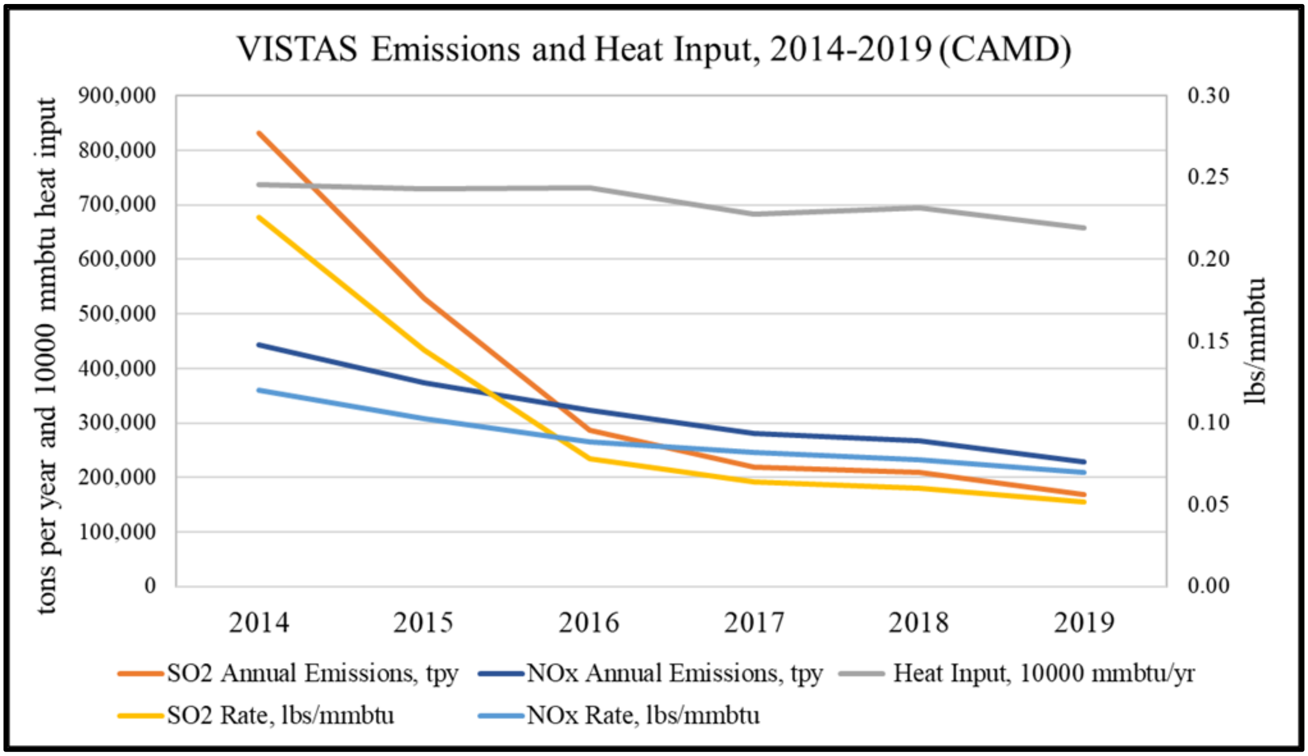

Figure 13-11: VISTAS CAMD Emissions and Heat Input Data ***(source: EPA CAMD Database)***

Between 2014 and 2019, heat input to these units decreased approximately 11%. However, emissions from these units and the emission rates decreased significantly more than this. SO_2 emissions decreased from 831,079 to 169,013 tons annually, a decrease of 80%. The average SO_2 emission rate from these units decreased from 0.225 lb/mmbtu in 2014 to 0.051 lb/mmbtu in 2019, a decrease of 77%. Additional controls installed on certain units to meet the stringent requirements of MATS has further reduced the emission rates of those units. Over the same period, NO_X emissions decreased from 442,412 tpy to 228,673 tpy, a drop of 48%.

The figures above reflect the fact that the reductions in SO_2 and NO_X are generally a result of permanent changes at EGUs through the use of control technology and fuel switching, not reductions in heat input. Thus, visibility improvements from reduced sulfate and nitrate contribution should continue into the future even if demand for power and heat input to these units may have moderate increases. In addition, market forces on coal EGUs have shifted these units from baseload operations to load following operations with increased usage of natural gas and renewable energy sources for electricity production.

13.5.2. Assessments of Changes in Anthropogenic Emissions

There does not appear to be any significant change in anthropogenic emissions within Florida that would limit or impede progress in reducing pollutant emissions or improving visibility. In particular, SO_2 emissions from point sources have significantly decreased since 2014. There have also been decreases in emissions of NO_X and $PM_{2.5}$ since 2014.

13.6. Conclusion

This progress report documents that all control measures outlined in Florida’s regional haze SIP have been implemented and that Florida has met all RPGs projected for 2018. Reductions in SO_2 emissions have been significant and greater than VISTAS projected. In spite of significant reduction in SO_2, sulfates continue to play a significant role in visibility impairment, especially for the most impaired days. As SO_2 emissions continue to drop in future planning periods, nitrates may begin to have a larger relative impact on regional haze. The next regional haze progress report is due by January 31, 2025, and will cover progress in the second implementation period.