

# Development of the 2028 Emissions Inventory for Regional Haze Modeling for the Southeastern States

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Regi Oommen

Eastern Research Group, Inc.

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# Acknowledgments (cont.)

- **VISTAS Participating Agencies**

- Alabama
- Florida
- Georgia
- Kentucky
- Mississippi
- North Carolina
- South Carolina
- Tennessee
- Virginia
- West Virginia
- Knox County, TN
- Eastern Band of Cherokee Indians

- **State Co-Chairs of VISTAS Project**

- Mr. Randy Strait, NC Department of Environmental Quality
- Dr. James Boylan, GA Department of Natural Resources



# Acknowledgments (cont.)

- State and Tribal Air Directors (STAD)
  - Focuses on Policy Decisions
- Coordinating Committee (CC)
  - Focuses on planning and SIP implications
- Technical Analysis Work Group (TAWG)
  - Technical experts on emissions, modeling, and air monitoring data



# Acknowledgments (cont.)

- Eastern Research Group, Inc. (ERG)
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- Alpine Geophysics, LLC (AG)
  - Mr. Gregory Stella
  - Mr. Dennis McNally





# Overview of the Presentation

- Background/Information
- Project Goals
- Data Sources
- Updates
- Emissions Comparison
- Observations/Lessons Learned



Final Report:

*Southeastern VISTAS II Regional Haze Analysis Project –Task 2  
Emission Inventory Updates Report. August 28, 2018.*



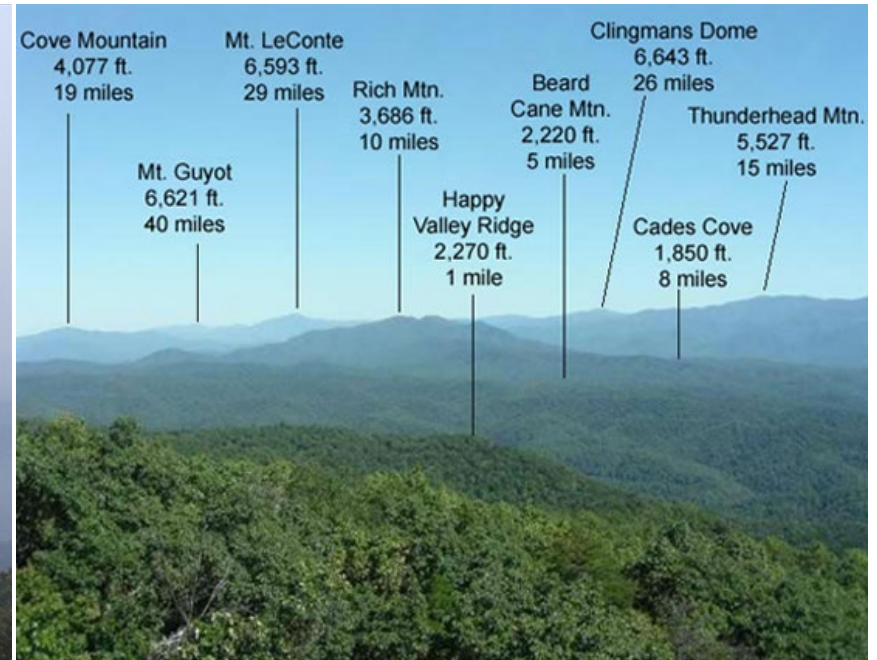
# Background/Information

- Regional Haze Rule (revised) - Promulgated in 2017 (82 FR 3078)
  - U.S. EPA designated SESARM to coordinate regional haze for the 10 southeastern states via the RPO
  - Tasked to assess visibility now, in interim years, and until 2064
  - Focus on SO<sub>2</sub> and NO<sub>x</sub> emission sources that impact Class I Areas (18 in SESARM states)

## Great Smoky Mountains – Look Rock



Hazy Day



Clear Day



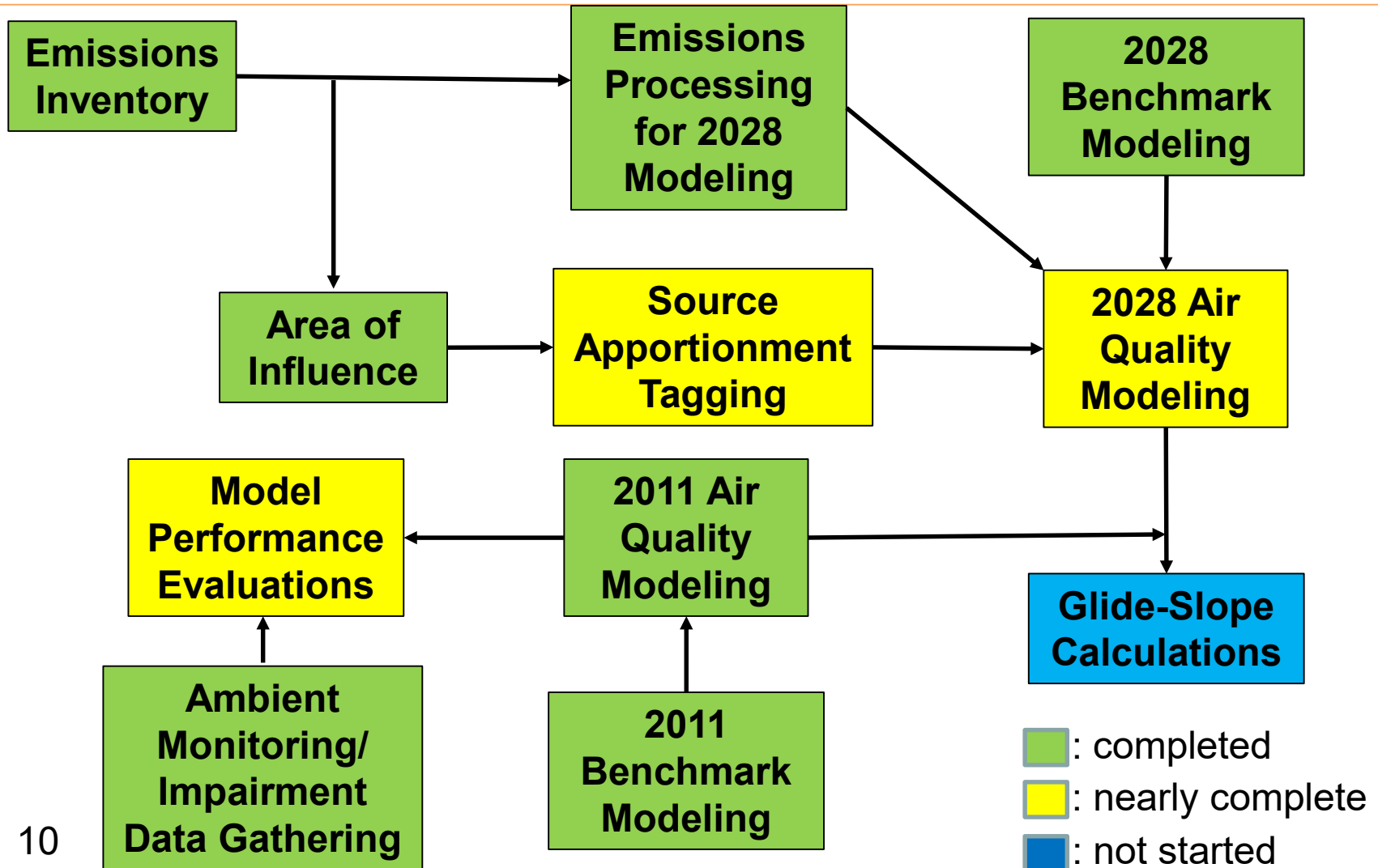


# Background/Information

- Major Project Tasks:
  - 2011 and 2028 emissions inventory (Task 2)
  - 2028 emissions processing (Task 3)
  - Ambient monitoring, meteorology, and Impairment data acquisition (Task 4)
  - Area of Influence Analysis (Task 5)
  - Air quality modeling benchmark evaluations, 2028 modeling, source tagging, model performance evaluations, and glide-slope calculations (Tasks 6, 7, 8, 9)



# Project Flow





# Task 2 Goals

- Update EPA 2028 Point Source Inventory
  - Eliminated benefits of Clean Power Plan (repealed); reflected continued changes in EGU fuel sources
  - Inclusion of new sources/units
  - Removal of closed sources/units
  - Emissions adjustments
  - Updated or new stack parameters/location coordinates
  - General cleanup (e.g., facility names)





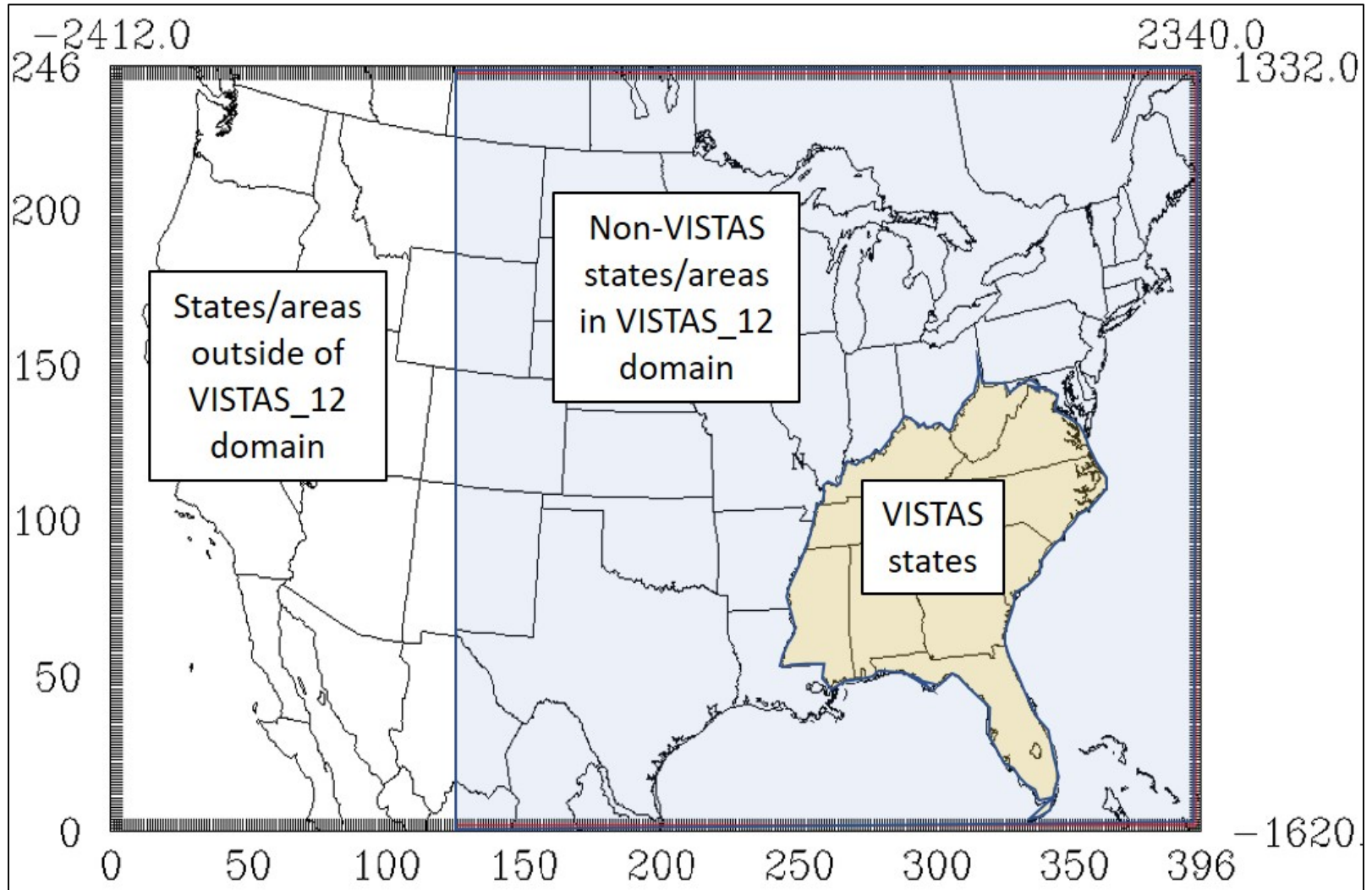
# Task 2 Goals

- No changes were made to the 2011 emissions
- Compiled, but no updates were made to these 2028 sector emissions:
  - Area nonpoint
  - Onroad
  - Nonroad (separate MAR\* and non-MAR)
  - Point-fires
  - Biogenics

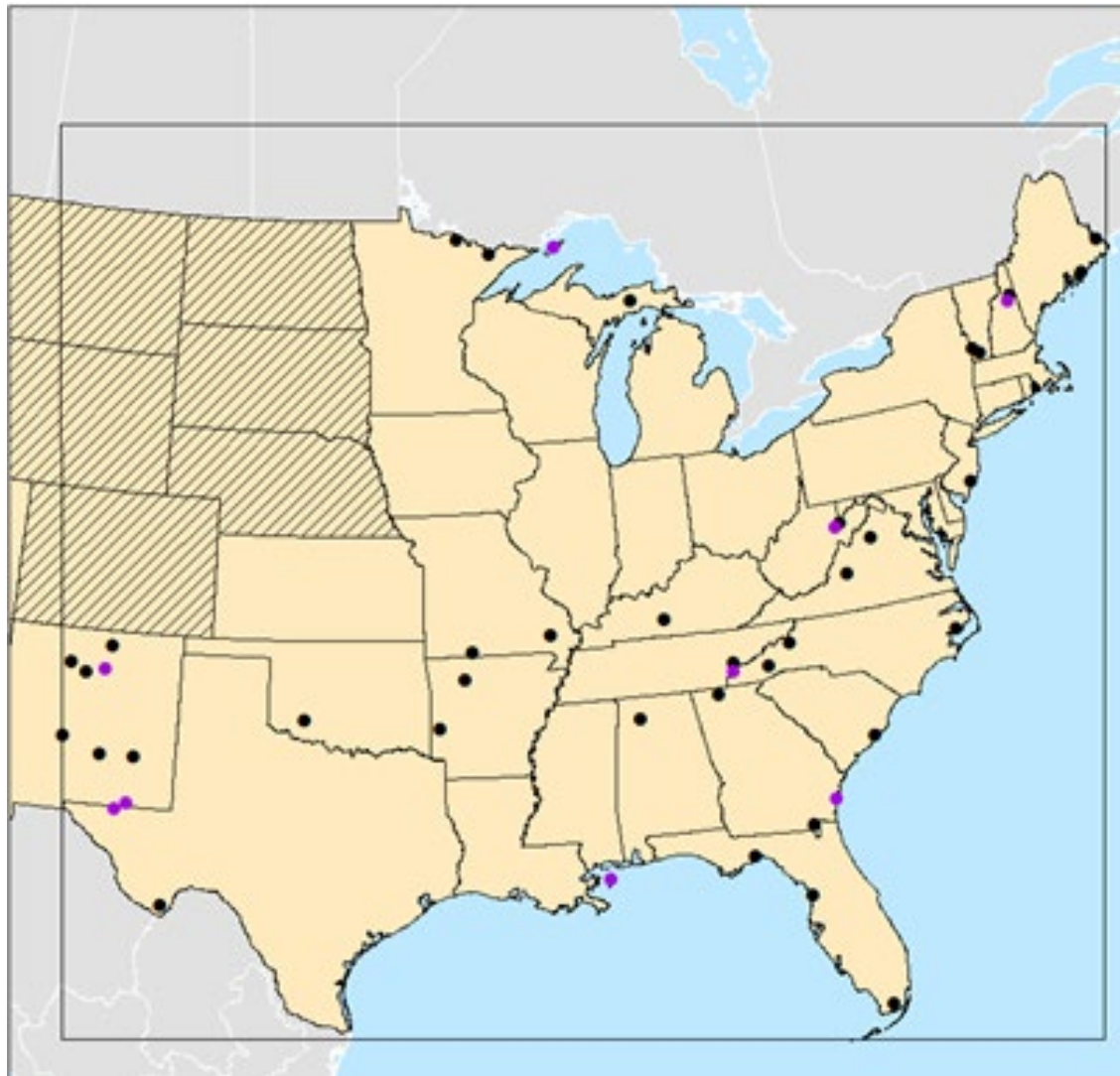
\* MAR: Marine, aircraft, and railyards



# Geographic Area of Interest



# Class 1 Areas – VISTAS Domain





# Class 1 Areas – SESARM States



## Legend

- IMPROVE\_Monitor\_Trajectory\_Origin\_VISTASONLY
- CentroidsForTrajectories\_VISTASONLY
- VISTAS Class I Areas



# Study Parameters

- Pollutants of interest:
  - CO, NH<sub>3</sub>, NO<sub>x</sub>, PM<sub>10</sub>-PRI, PM<sub>2.5</sub>-PRI, SO<sub>2</sub>, and VOC
- Data Sources (EPA FTP site):
  - 2011 “el” emissions inventory datasets (includes some “ek” files)
  - 2028 “el” emissions inventory datasets
  - 2023 “en” emissions inventory datasets
  - 2028 base year emissions inventory for EGUs developed by the Eastern Regional Technical Advisory Committee (ERTAC)





# State Review – EGUs

- States reviewed 2011, 2023, and 2028 point sources emissions side-by-side
  - Included non-EGU point sources operating at the EGU (e.g. – commercial-sized boilers)
  - EPA 2028 EGU emissions included the impacts of the CPP
  - EPA 2023 EGU emissions excluded the impacts of the CPP
  - ERTAC 2028 EGU emissions excluded the impacts of the CPP
- States provided updates for 2028



# State Review – EGUs

- Example Action Items:
  - “Use 2028 EPA emissions”
  - “Use 2028 ERTAC emissions”
  - “Use 2023 EPA emissions”
  - “Use 2011 EPA emissions”
  - “EGU set to retire before 2028; set emissions to 0”
  - “Use state-provided emissions for 2028”
  - Combinations (e.g. – “Use EPA 2023 emissions for all pollutants, except NO<sub>x</sub>. Use state-provided emissions.”)



# State Review – EGU Action Items

State	# Action Items	% of Action Items
Alabama	458	7.2%
Florida	1,117	17.5%
Georgia	364	5.7%
Kentucky	792	12.4%
Mississippi	313	4.9%
North Carolina	870	13.6%
South Carolina	820	12.8%
Tennessee	624	9.8%
Virginia	707	11.1%
West Virginia	326	5.1%
<b>Totals</b>	<b>6,391</b>	



# State Review – Non-EGUs

- States reviewed 2011, 2023, and 2028 point sources emissions side-by-side
  - Included aircrafts and railyards
- States provided updates for 2028
  - e.g. - North Carolina provided a wholesale replacement of non-EGU point source emissions due to updated projection factors not included in the 2028 EPA “el” emissions.



# State Review – Non-EGUs

- Example Action Items:
  - “Use 2028 EPA emissions”
  - “Use 2023 EPA emissions”
  - “Use 2011 EPA emissions”
  - “Use 2014 NEI emissions”
  - “Unit set to retire before 2028; set emissions to 0”
  - “Use state-provided emissions for 2028”
  - “Adjust state-provided facility-level 2028 emissions for all pollutants to the process-level using process-level emission proportions from EPA 2023.”
  - Combinations (e.g. – “Use EPA 2023 emissions for all pollutants, except NO<sub>x</sub>. Use state-provided emissions.”)



# State Review – Non-EGU Action Items

State	# Action Items	% of Action Items
Alabama	6,754	6.3%
Florida	7,729	7.2%
Georgia	6,736	6.3%
Kentucky	33,399	31.0%
Mississippi	6,004	5.6%
North Carolina	21,730	20.2%
South Carolina	9,071	8.4%
Tennessee	7,229	6.7%
Virginia	4,409	4.1%
West Virginia	4,691	4.4%
<b>Totals</b>	<b>107,752</b>	



# Stack Parameter Updates – State-Directed

State	# Facilities	# Release Points
Alabama	0	0
Florida	0	0
Georgia	1	13
Kentucky	0	0
Mississippi	0	0
North Carolina	8	14
South Carolina	0	0
Tennessee	4	9
Virginia	0	0
West Virginia	0	0
<b>Totals</b>	<b>13</b>	<b>36</b>



# Stack Parameter Updates – SCC Defaults

State	# Facilities	# Release Points
Alabama	0	0
Florida	0	0
Georgia	1	1
Kentucky	1	1
Mississippi	0	0
North Carolina	1	4
South Carolina	6	43
Tennessee	0	0
Virginia	9	29
West Virginia	4	11
<b>Totals</b>	<b>22</b>	<b>89</b>





# Blend/Merge

- 2028 point EGU and non-EGU emissions were converted to File Format 2010 (FF10)
- Data fields required and necessary for modeling were populated
  - Latlon coordinates and stack parameters were provided for new facilities
- Emission totals in FF10 matched master emissions inventory and state-reviewed emission files



# Revised Emissions – Point EGU Sources

<b>Pollutant</b>	<b>EPA 2028 Emissions (tpy)</b>	<b>Revised 2028 Emissions (tpy)</b>	<b>% DIFF</b>
CO	224,962	114,328	-49.2%
NH <sub>3</sub>	13,798	8,576	-37.8%
NO <sub>x</sub>	207,615	246,719	+18.8%
PM <sub>10</sub> -PRI	60,736	54,501	-10.3%
PM <sub>2.5</sub> -PRI	45,089	44,017	-2.4%
SO <sub>2</sub>	304,112	231,414	-23.9%
VOC	10,345	10,733	+3.8%

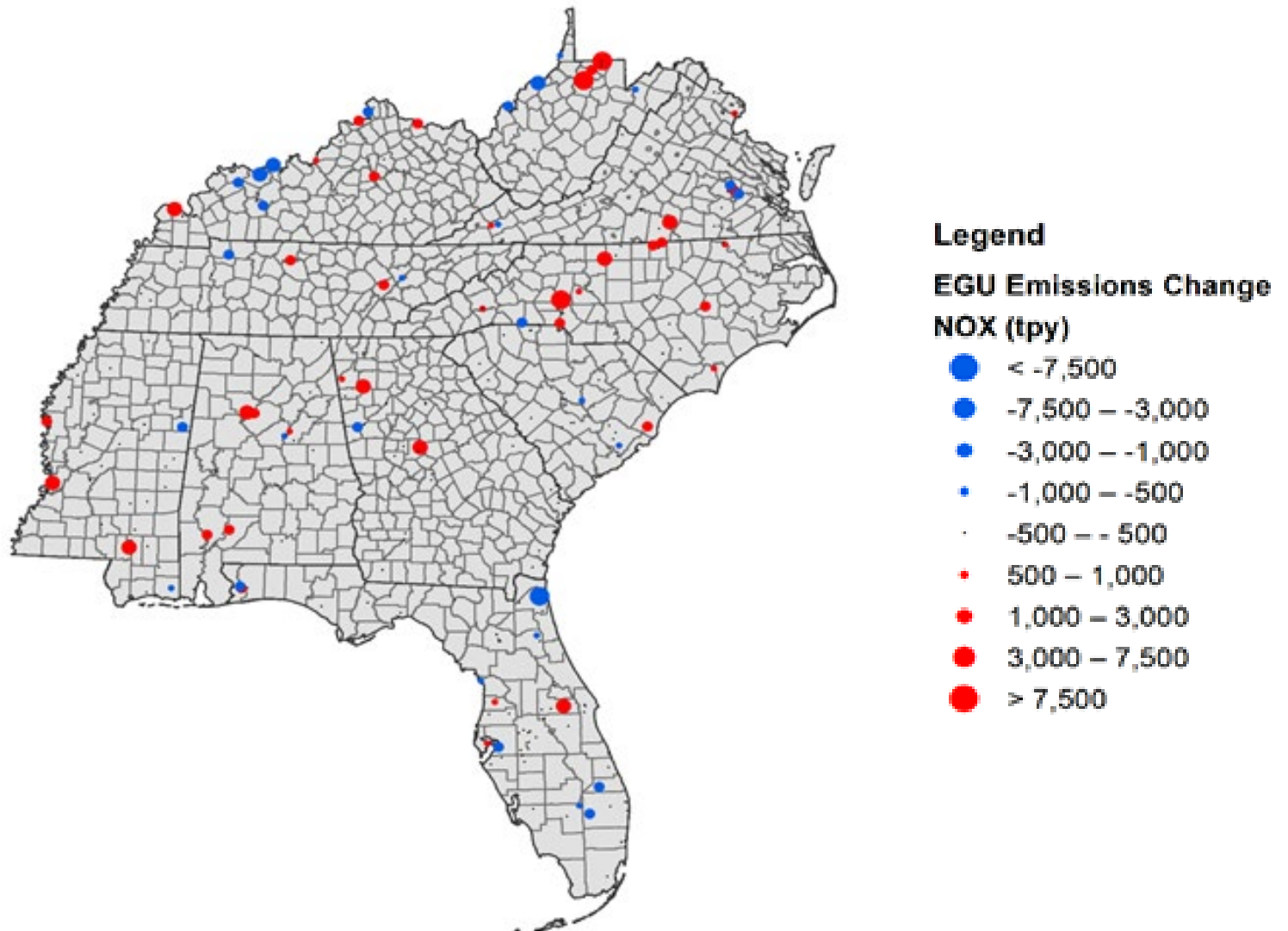


# Revised Emissions – Point Non-EGU Sources

<b>Pollutant</b>	<b>EPA 2028 Emissions (tpy)</b>	<b>Revised 2028 Emissions (tpy)</b>	<b>% DIFF</b>
CO	592,201	598,193	+1.0%
NH <sub>3</sub>	17,713	16,302	-8.0%
NO <sub>x</sub>	349,516	343,788	-1.6%
PM <sub>10</sub> -PRI	109,846	108,926	-0.8%
PM <sub>2.5</sub> -PRI	84,512	83,380	-1.3%
SO <sub>2</sub>	250,187	224,296	-10.3%
VOC	263,606	272,574	+3.4%

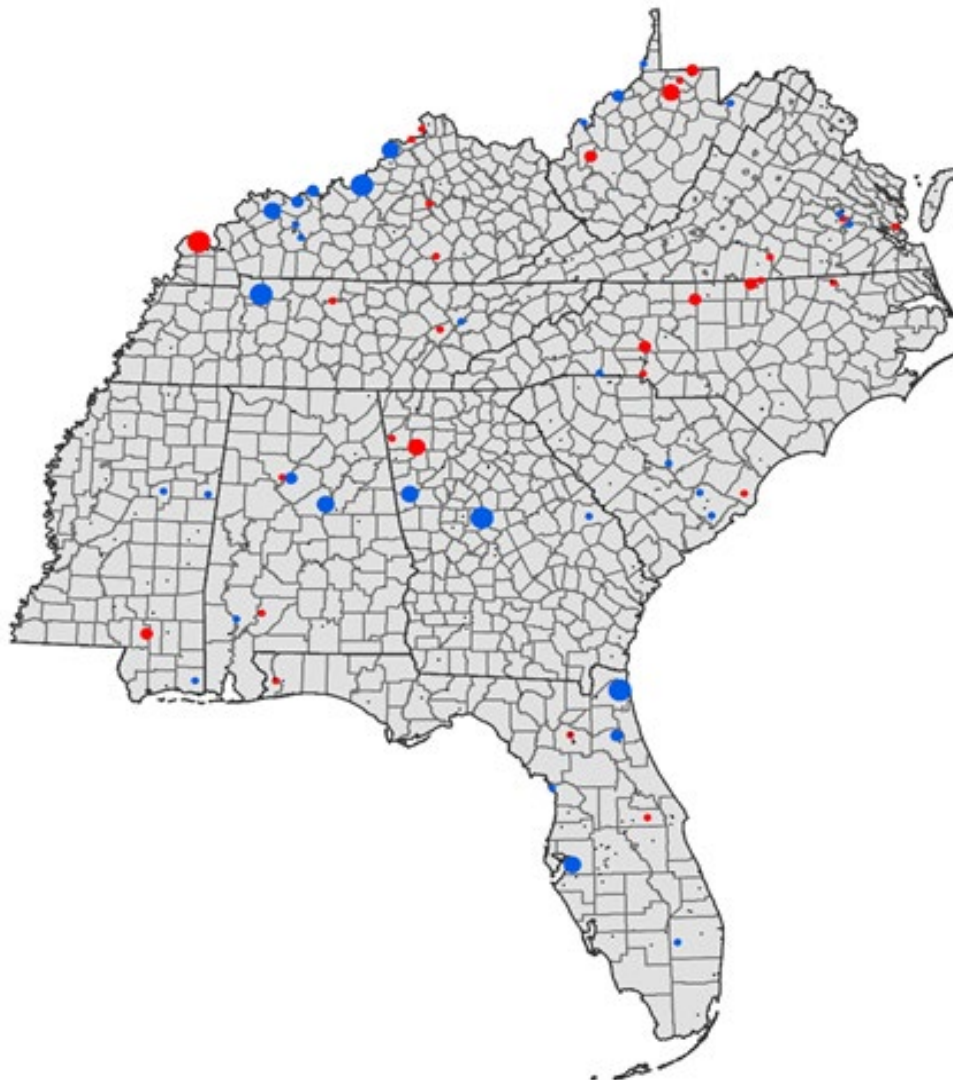


# 2028 EGU Point NO<sub>x</sub> Emission Change Maps (VISTAS – EPA)





# 2028 EGU Point SO<sub>2</sub> Emission Change Maps (VISTAS – EPA)



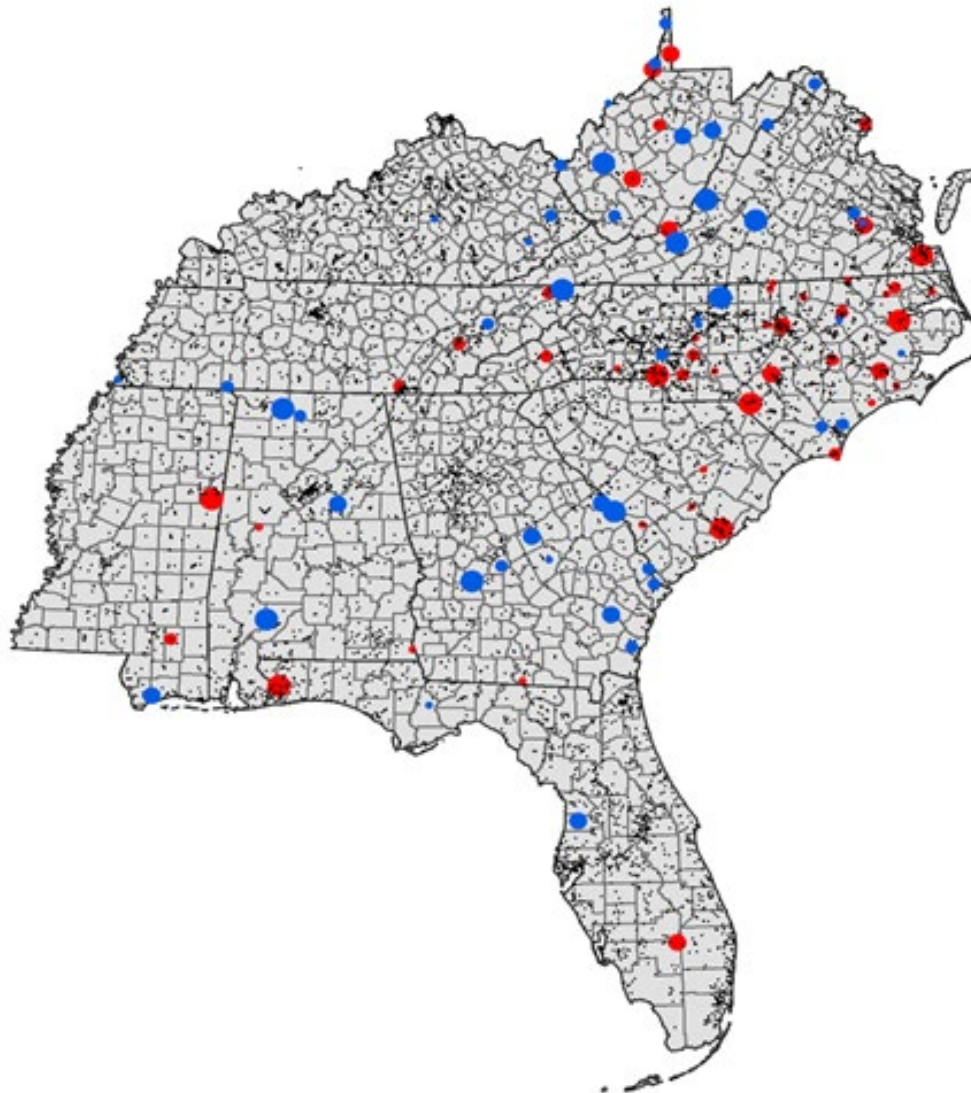
## Legend

### EGU Emissions Change SO<sub>2</sub> (tpy)

- < -12,000
- -12,000 – -6,000
- -6,000 – -3,000
- -3,000 – -300
- -300 – 300
- 300 – 3,000
- 3,000 – 6,000
- 6,000 – 12,000
- > 12,000



# 2028 Non-EGU Point NO<sub>x</sub> Emission Change Maps (VISTAS – EPA)



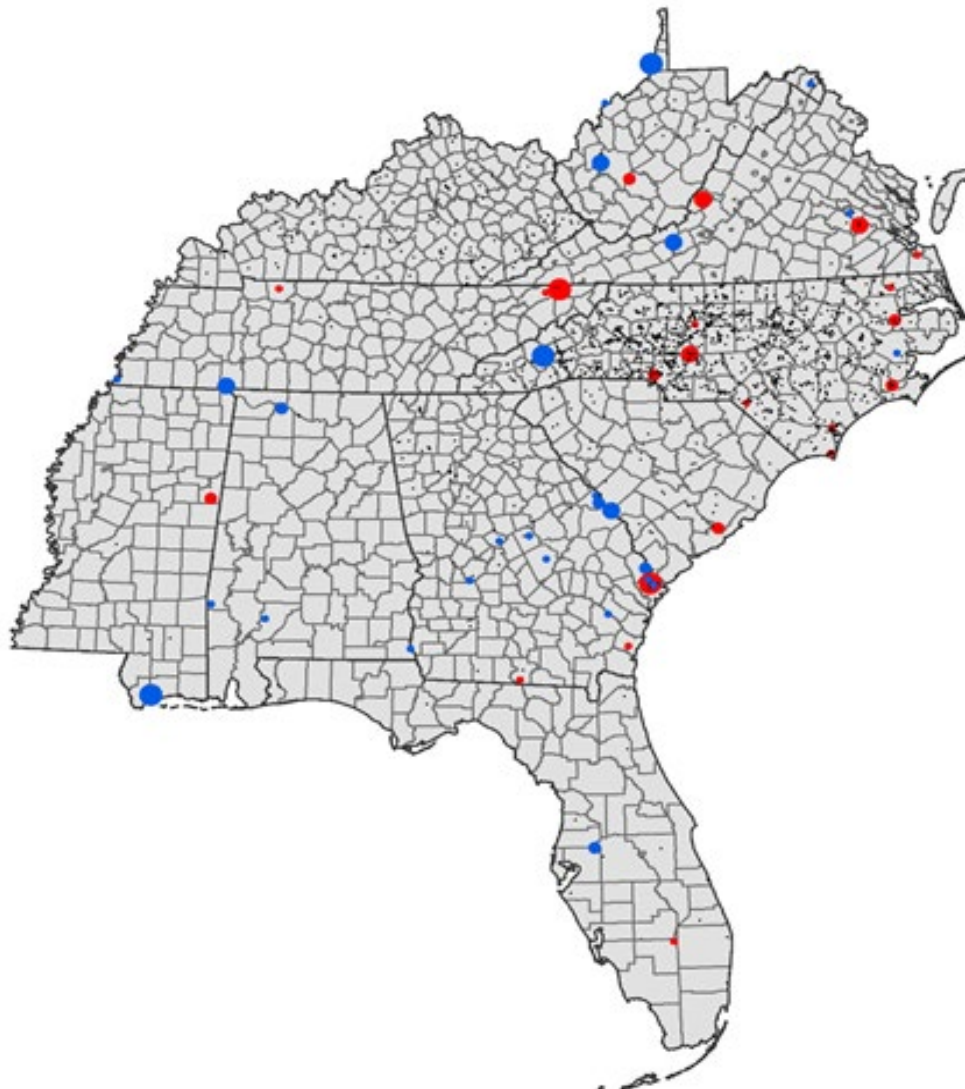
## Legend

### Non-EGU Emissions Change NO<sub>x</sub> (tpy)

- > -1,000
- -1,000 – -500
- -500 – -250
- -250 – -125
- -125 – 125
- 125 – 250
- 250 – 500
- 500 – 1,000
- > 1,000



# 2028 Non-EGU Point SO<sub>2</sub> Emission Change Maps (VISTAS – EPA)



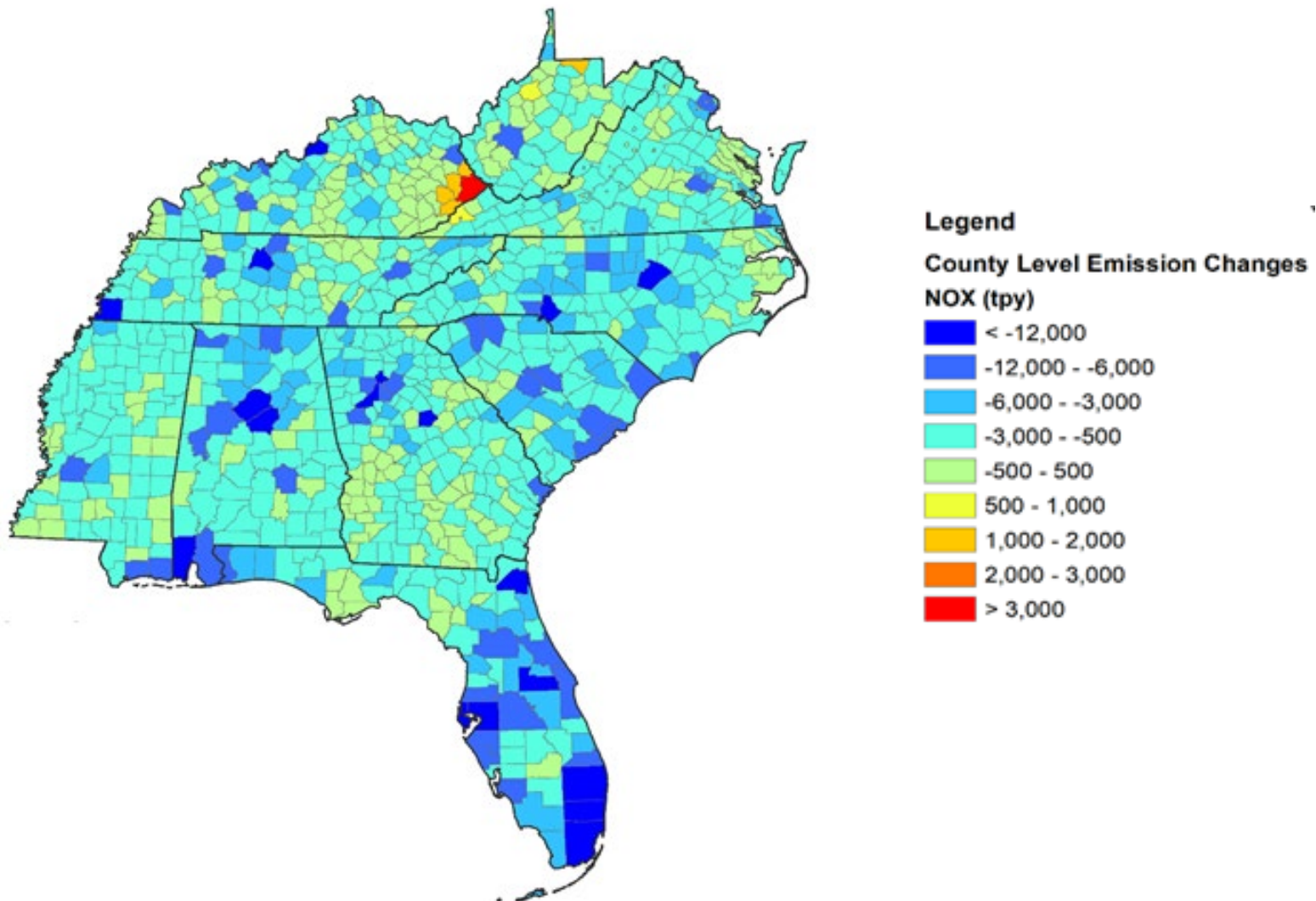
## Legend

### Non-EGU Emissions Change SO<sub>2</sub> (tpy)

- < -4,500
- -4,500 – -2,000
- -2,000 – -1,000
- -1,000 – -250
- -250 – 100
- 100 – 250
- 250 – 1,000
- 1,000 – 2,000
- > 2,000

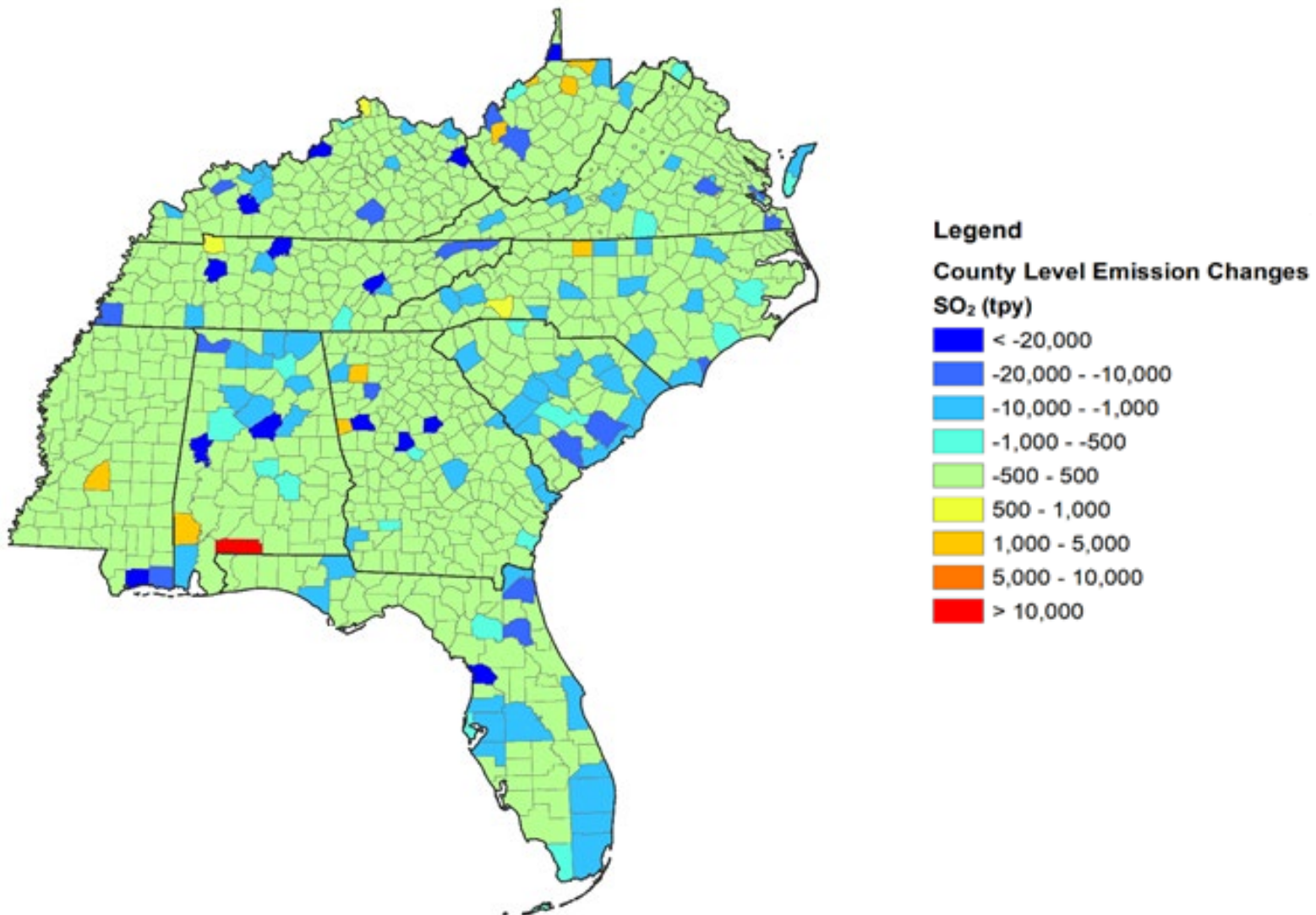


# County-Level NO<sub>x</sub> Emissions Comparison: 2011 vs. 2028, All Sectors (except biogenic)





# SO<sub>2</sub> County-Level Emissions Comparison: 2011 vs. 2028, All Sectors (except biogenic)





# Observations/Lessons Learned

- 2028 emissions changes were significant
  - Multiple stakeholder input improved the emissions inventory within the SESARM states
    - Point EGU NO<sub>x</sub> emissions: 18.8% increase (~39,000 tons)
    - Point EGU SO<sub>2</sub> emissions: 23.9% decrease (~73,000 tons)
- SO<sub>2</sub> emissions are still the major haze contributor



# Observations/Lessons Learned

- Emissions maps (revised vs. updated and 2011 vs. 2028) identified potential QA issues
- The major facility landscape continues to change
  - Shutdowns, fuel switches, additional emissions controls



# Thanks!

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