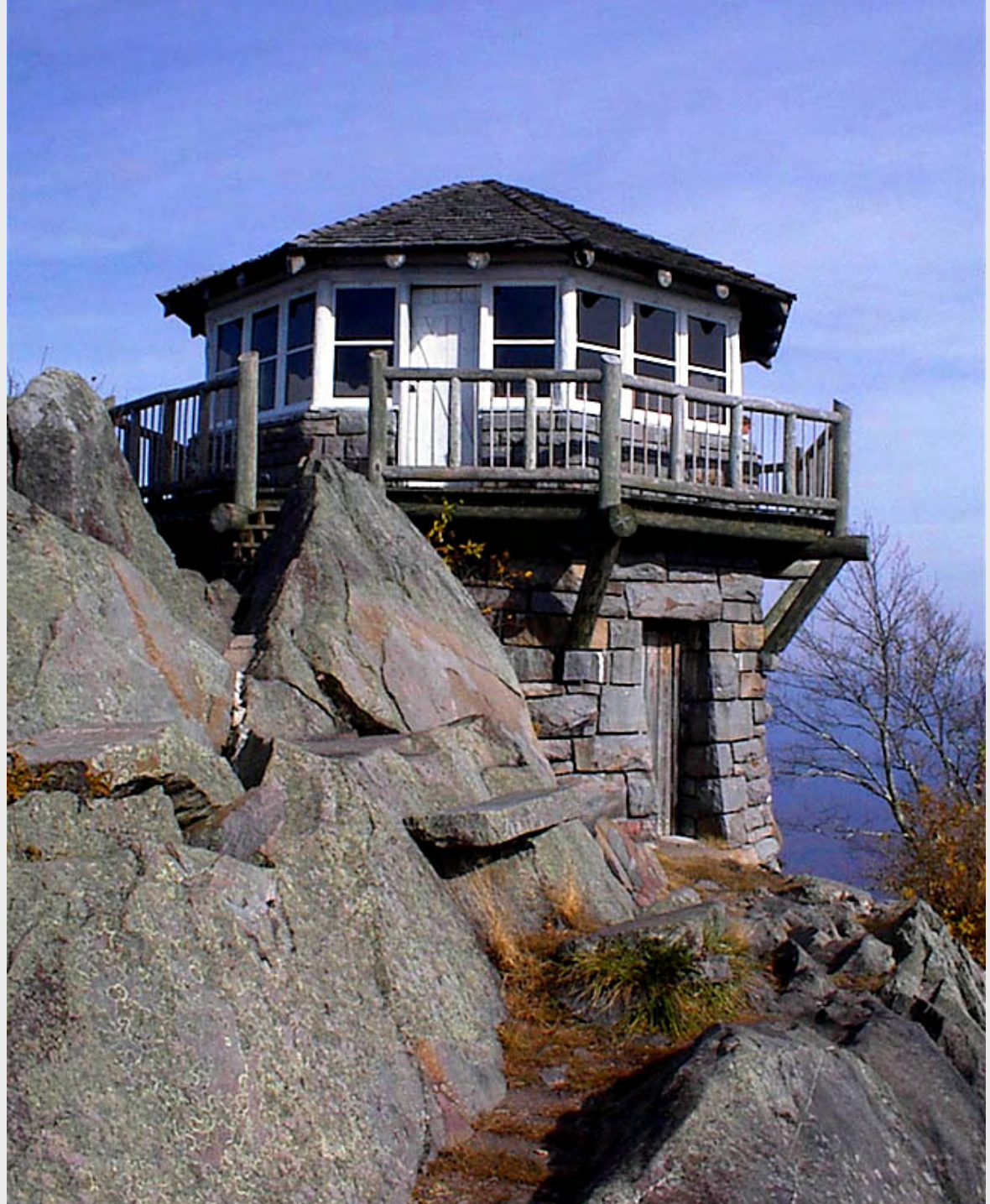




# VISTAS Analyses for Reasonable Progress

CAPCA Meeting

April 12, 2007





# Presentation Objectives

---

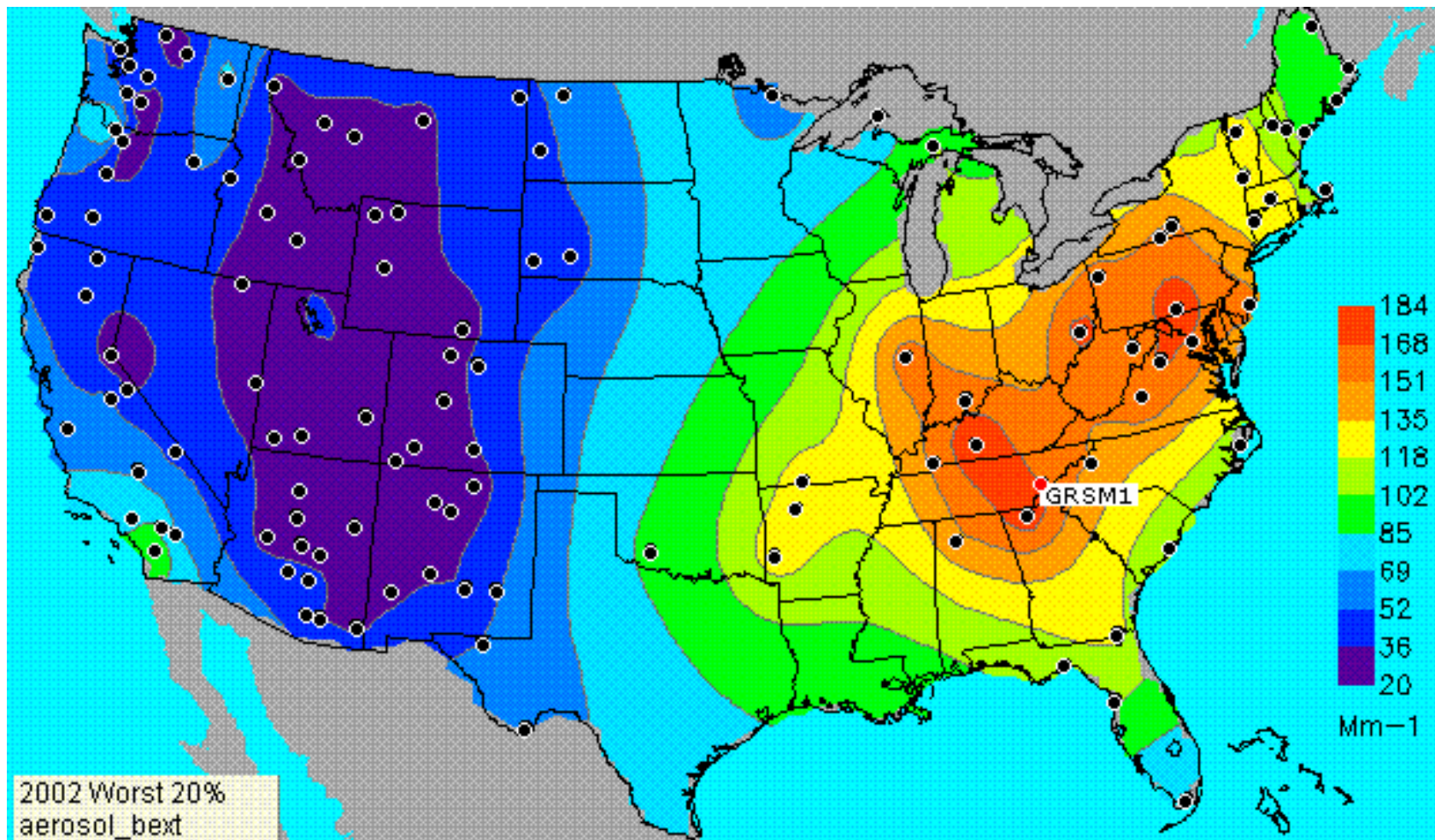
- VISTAS Overview
  - Contributions
  - VISTAS 2018 modeling results
  - Reasonable Progress Analysis
- State Implementation Planning
  - Next Speakers

Regional Haze Rule requires states to protect visibility in 156 "Class I" natural parks and wilderness areas.



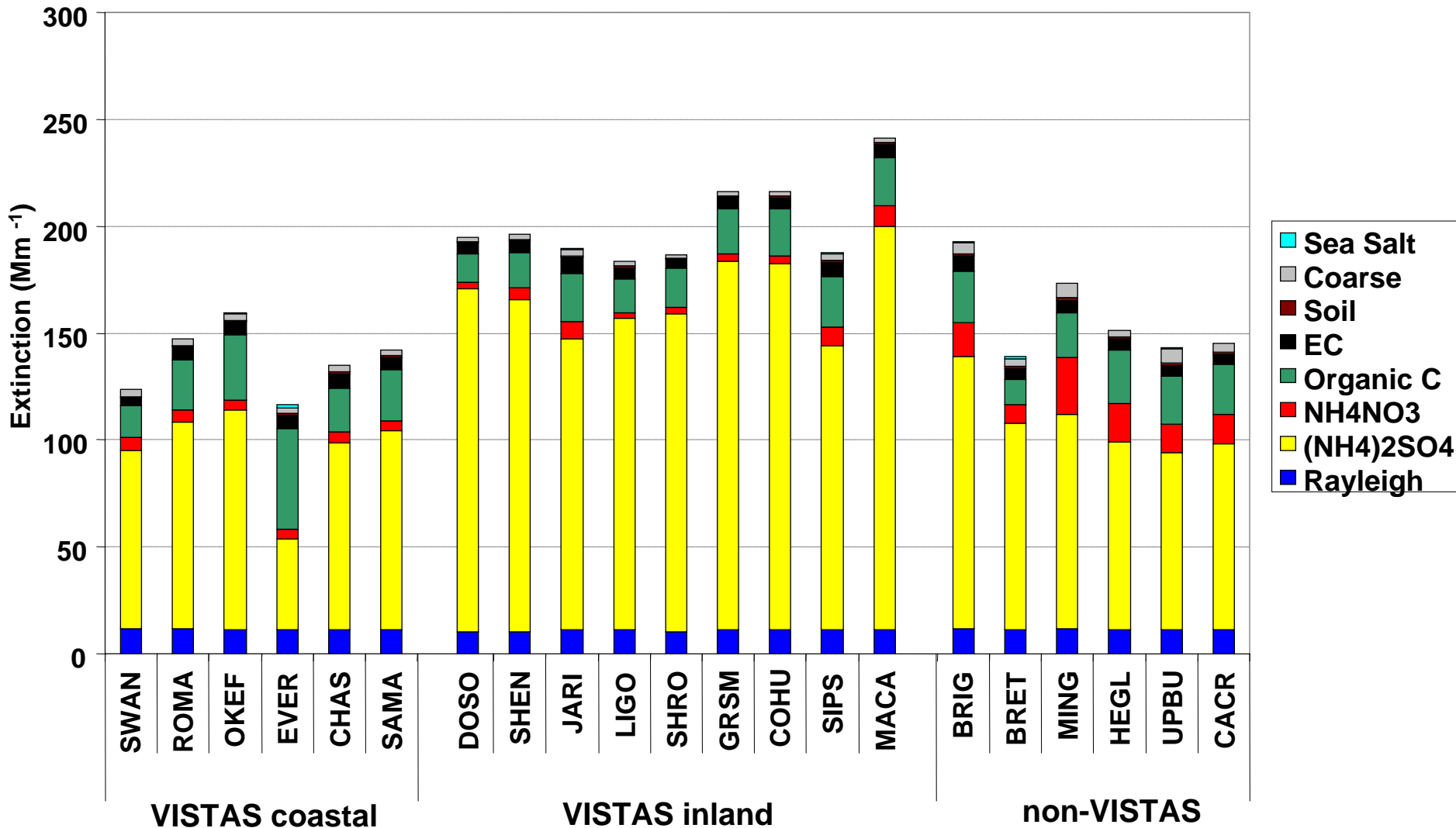
Cold Mountain, Shining Rock Wilderness Area

# Areas with Poorest Visibility are similar to PM2.5 Non-attainment Areas



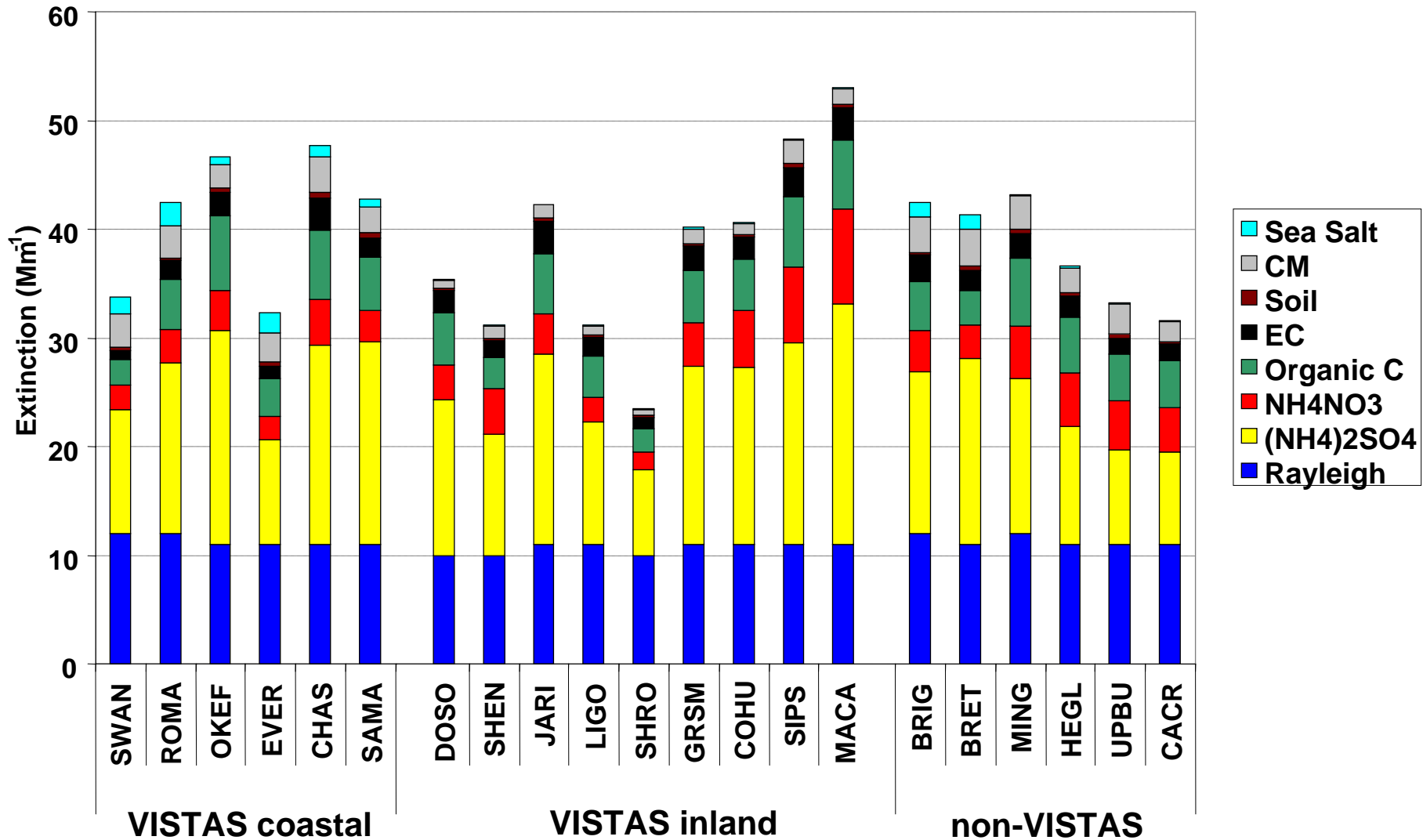
# Average Extinction for 20% Hazyest Days 2000-2004

New IMPROVE Algorithm



# Average Extinction for 20% Best Days 2000-2004

New IMPROVE Algorithm





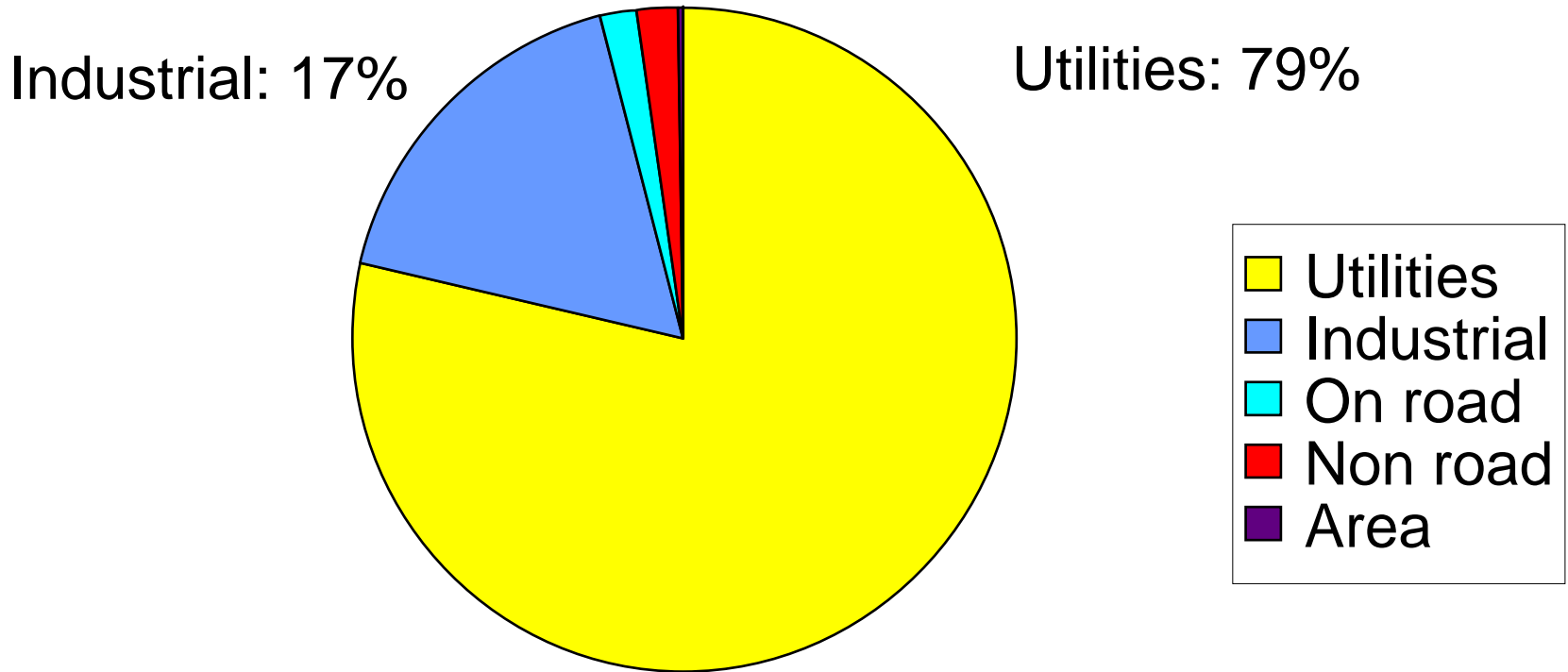
# Conclusions: Contributions

---

- On 20% Haziest Days
  - SO<sub>4</sub> dominates light extinction
  - Organic carbon second most important; fire indicated on few days
  - NO<sub>3</sub> contribution small
- SO<sub>4</sub> also dominates 20% Best Days
- Conclude: Focus on reducing SO<sub>2</sub> emissions

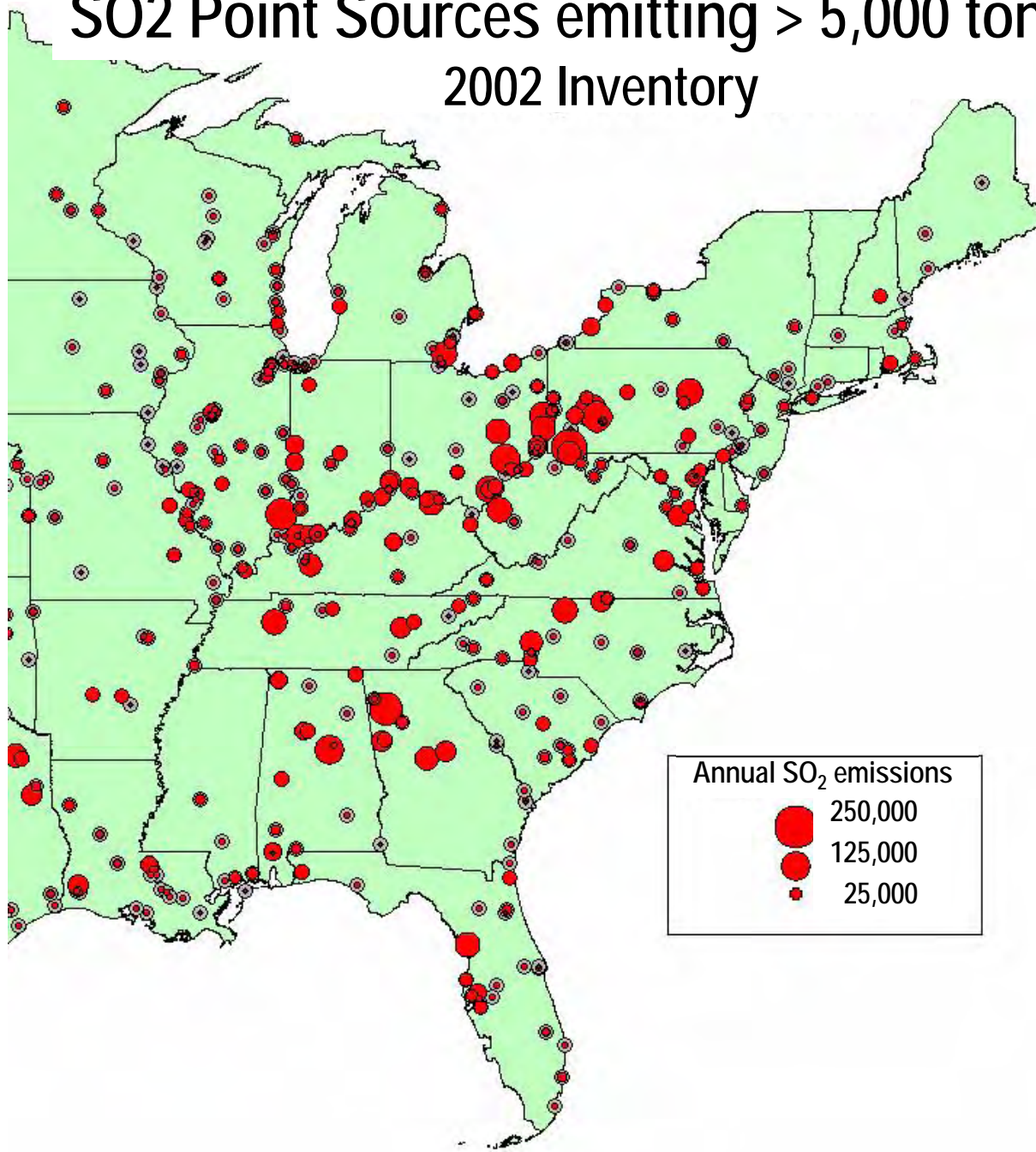
# VISTAS States SO2 Emissions - 2002

4.9 Million tons



96% of SO2 Emissions in the VISTAS States in 2002  
from Utility and Industrial Point Sources

# SO<sub>2</sub> Point Sources emitting > 5,000 tons per year 2002 Inventory



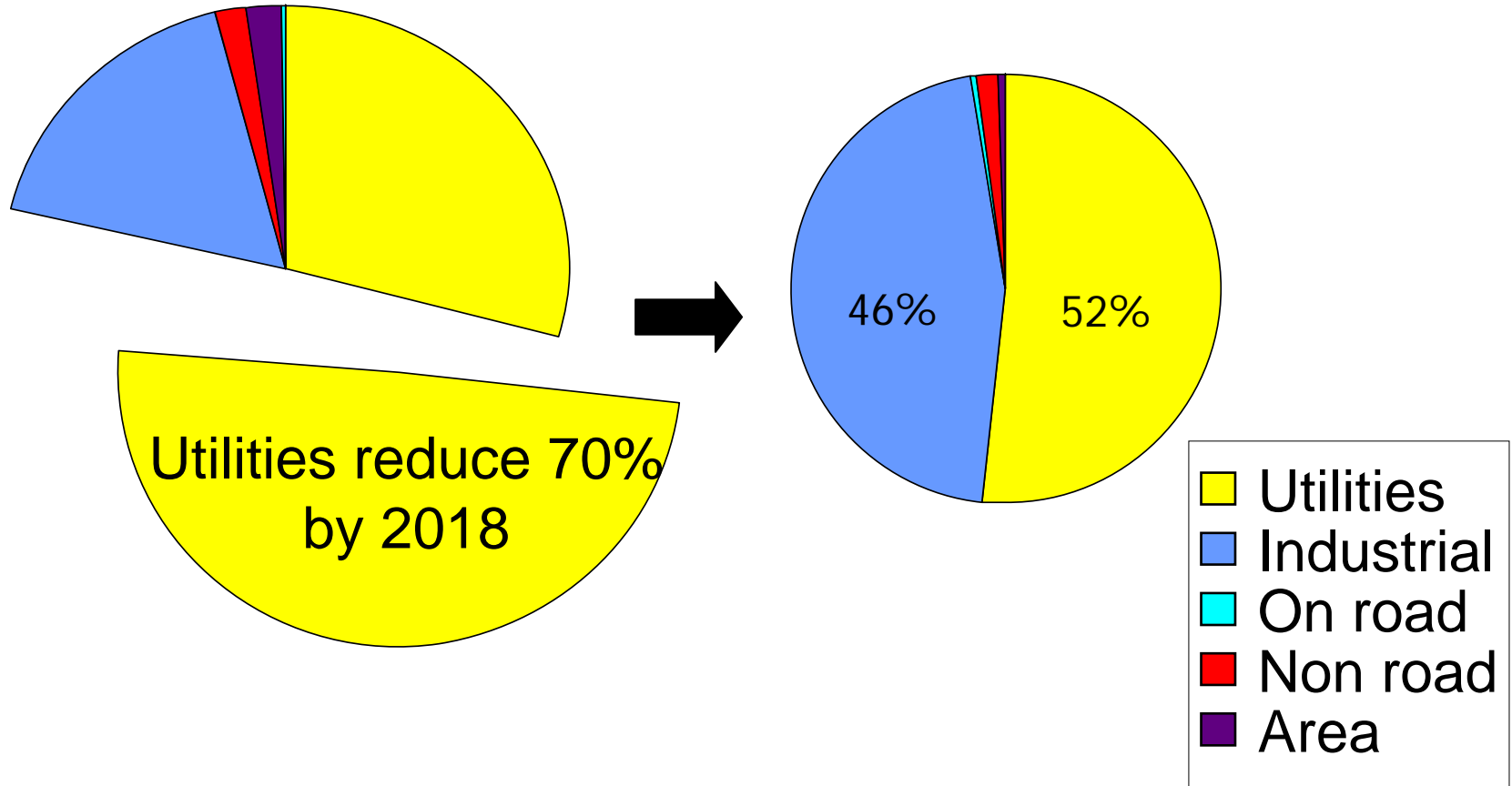


Progress Energy facility in Asheville, NC

# VISTAS States SO2 Emissions

2002: 4.9 Million tons

2018: 2.2 Million tons





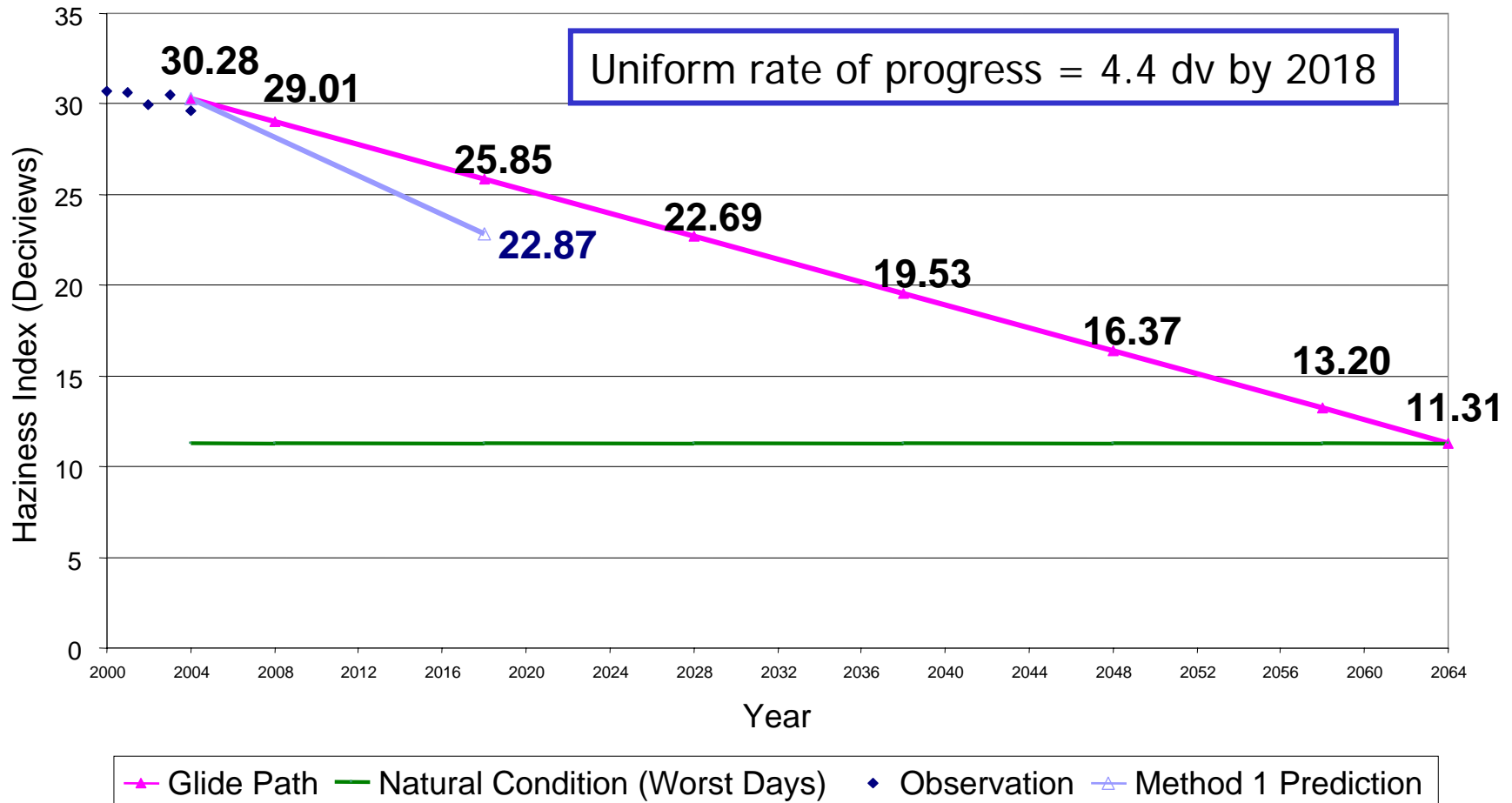
# VISTAS 2018 Base G2 Visibility Projections (Delivered Mar 2007)

---

- CMAQ Air Quality Model 2018 Run
  - Accounts for Clean Air Interstate Rule (utility controls)
  - Does not include controls for BART (Best Available Retrofit Technology)
  - VISTAS states inventories as of Feb 2007
  - Inventories for neighboring states effective Aug 2006

# Uniform Rate of Progress Glide Path Great Smoky Mountains - 20% Worst Days

New IMPROVE equation



Similar results for Shining Rock, Linville Gorge, Cohutta, VA, WV sites

# 20% Haziest Days at Great Smoky Mtns

2000-2004

2018 Base F

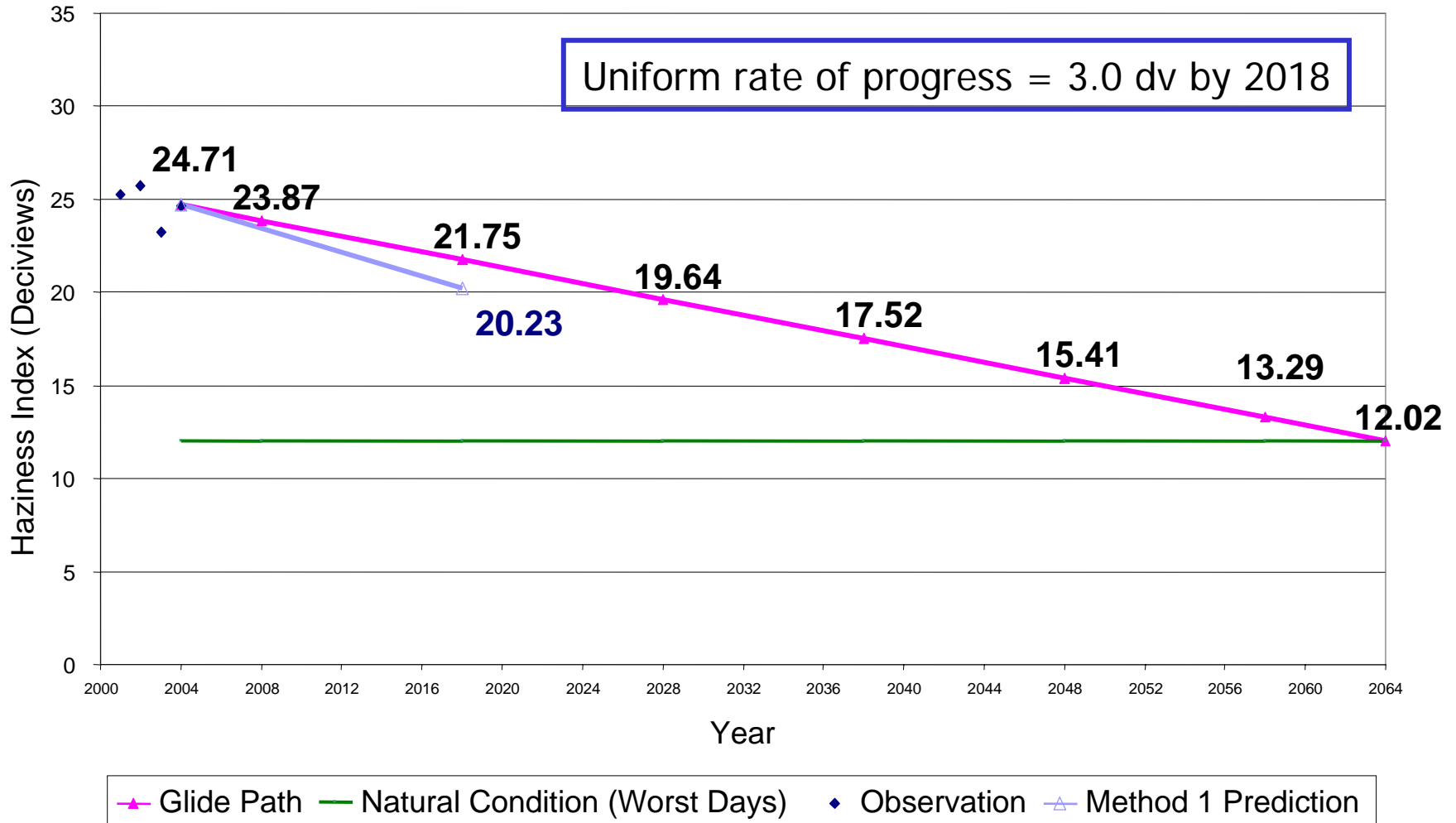


# Natural Background Visibility Great Smoky Mtns



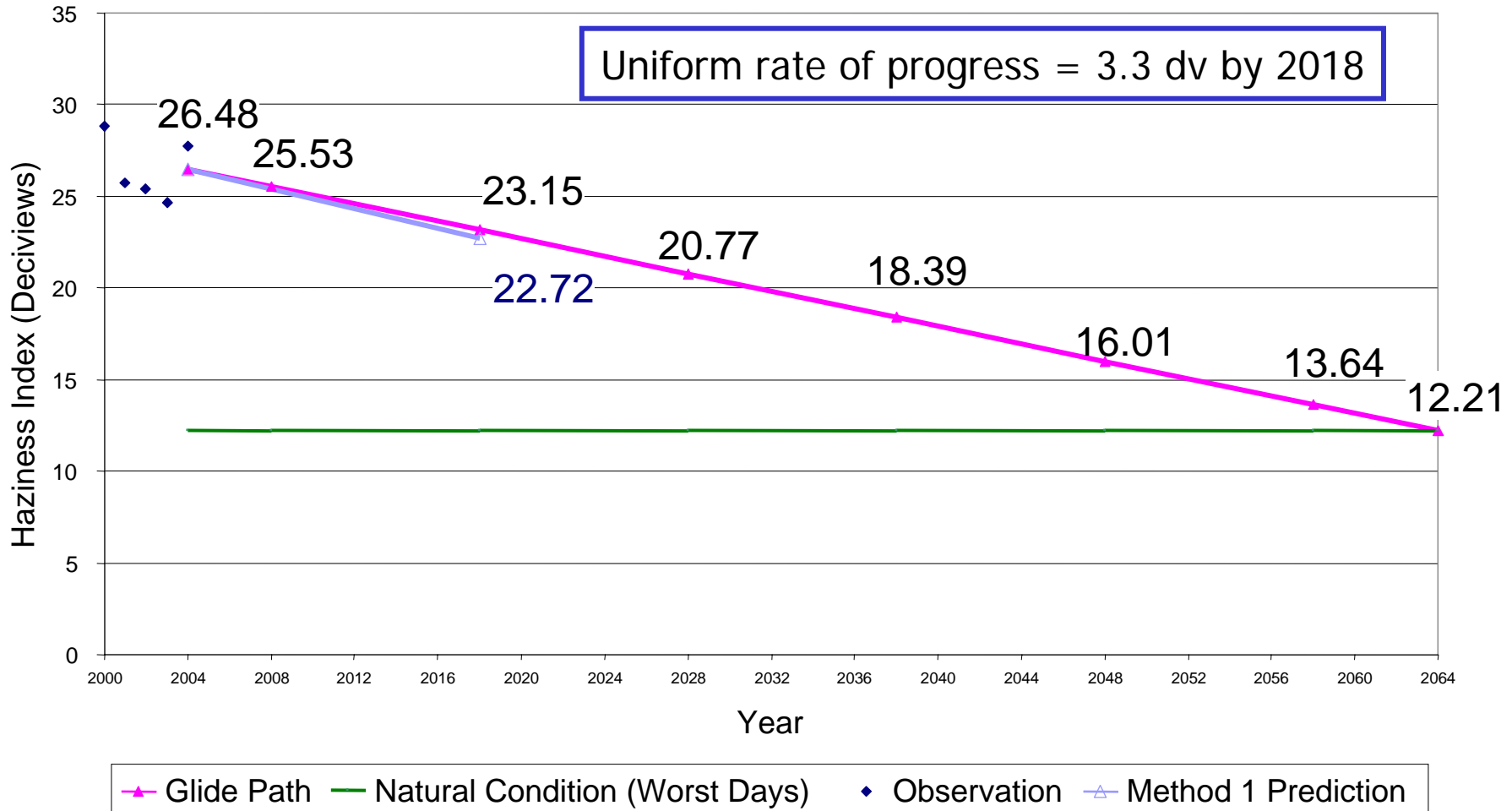
# Uniform Rate of Progress Glide Path Swanquarter - 20% Worst Days

New IMPROVE equation



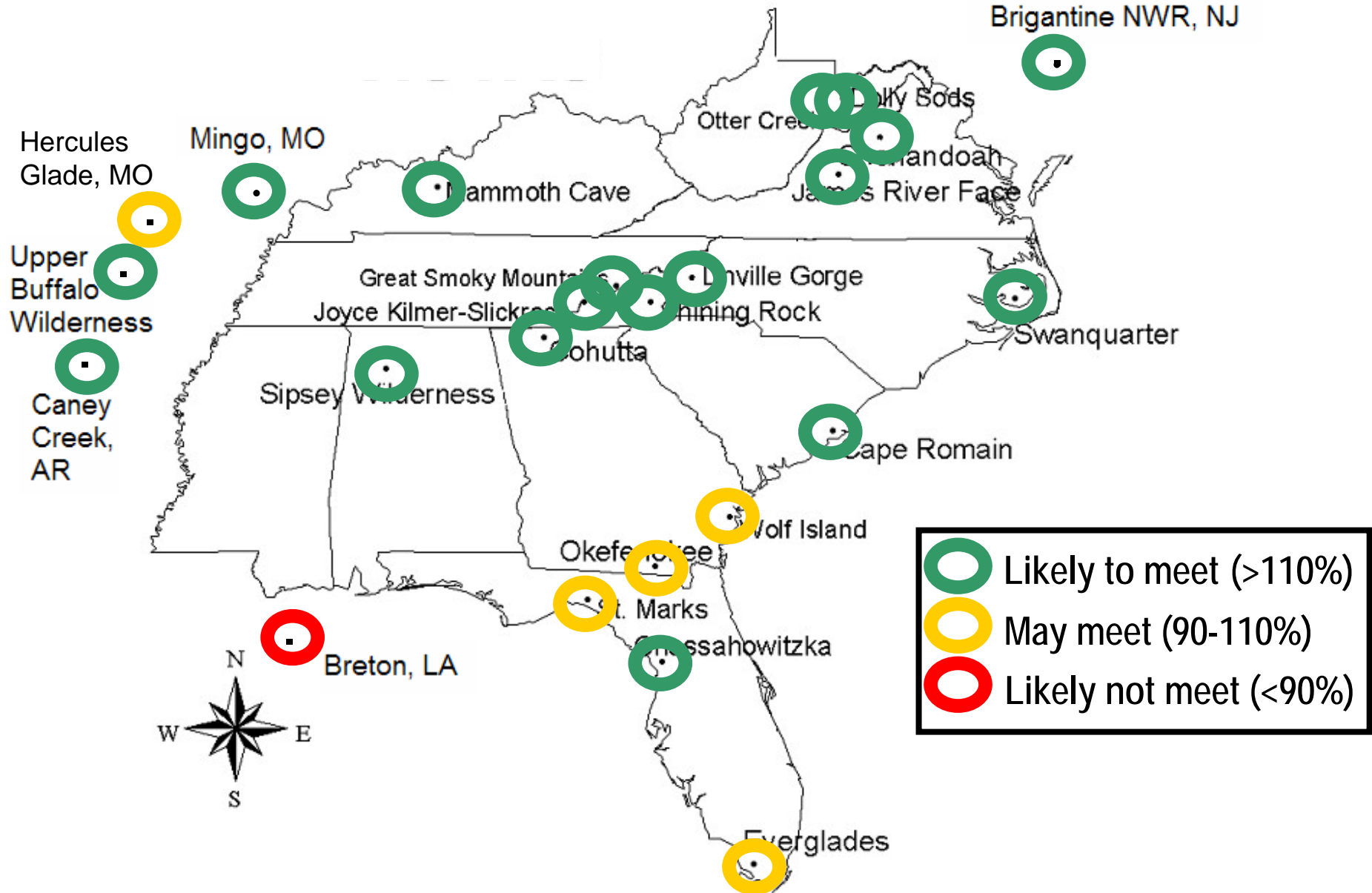
# Uniform Rate of Progress Glide Path Cape Romain - 20% Worst Days

New IMPROVE equation



# VISTAS 2018 Base G2a (Apr 4 2007) Uniform Rate of Progress

## Using New IMPROVE equation





# VISTAS Reasonable Progress Analyses

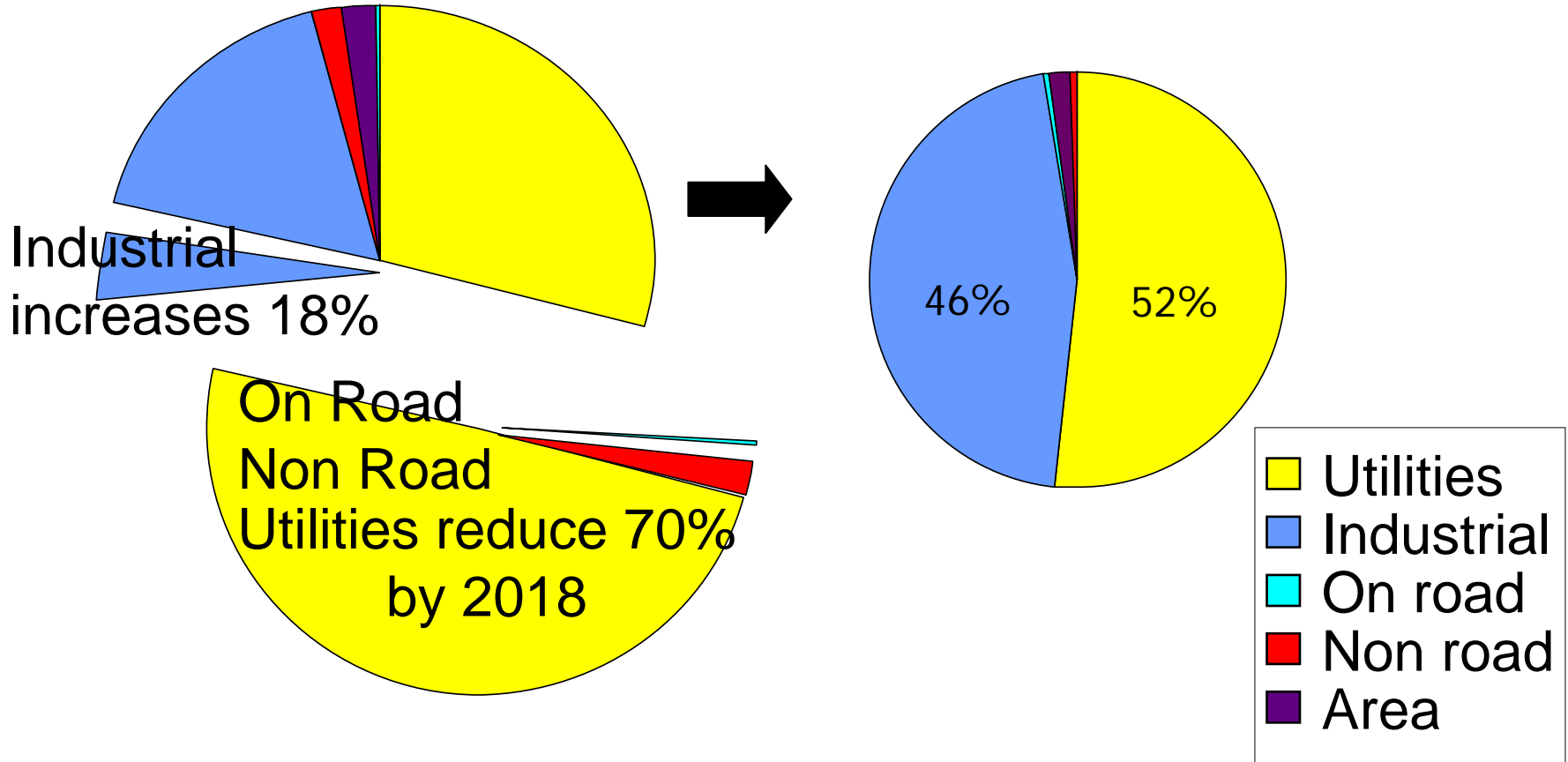
---

- Given projected 2018 emissions, what additional emissions reductions would be reasonable?
  - Consider Source Sectors
  - Consider Geographic Area of Influence
  - Consider Individual Sources

# VISTAS States SO2 Emissions

2002: 4.9 Million tons

2018: 2.2 Million tons



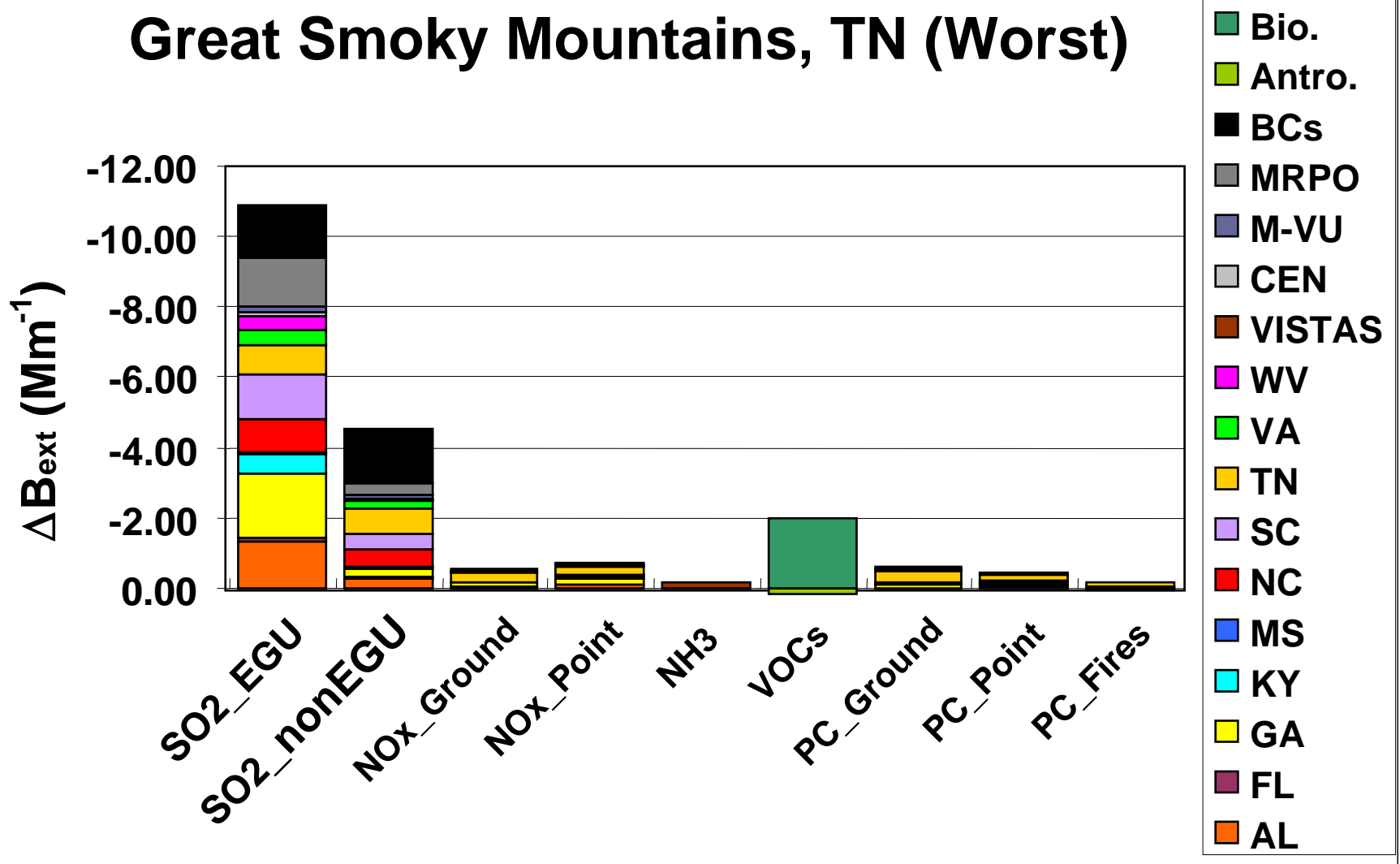


# VISTAS Source Sector Emissions Sensitivities (Delivered Jan 2006)

---

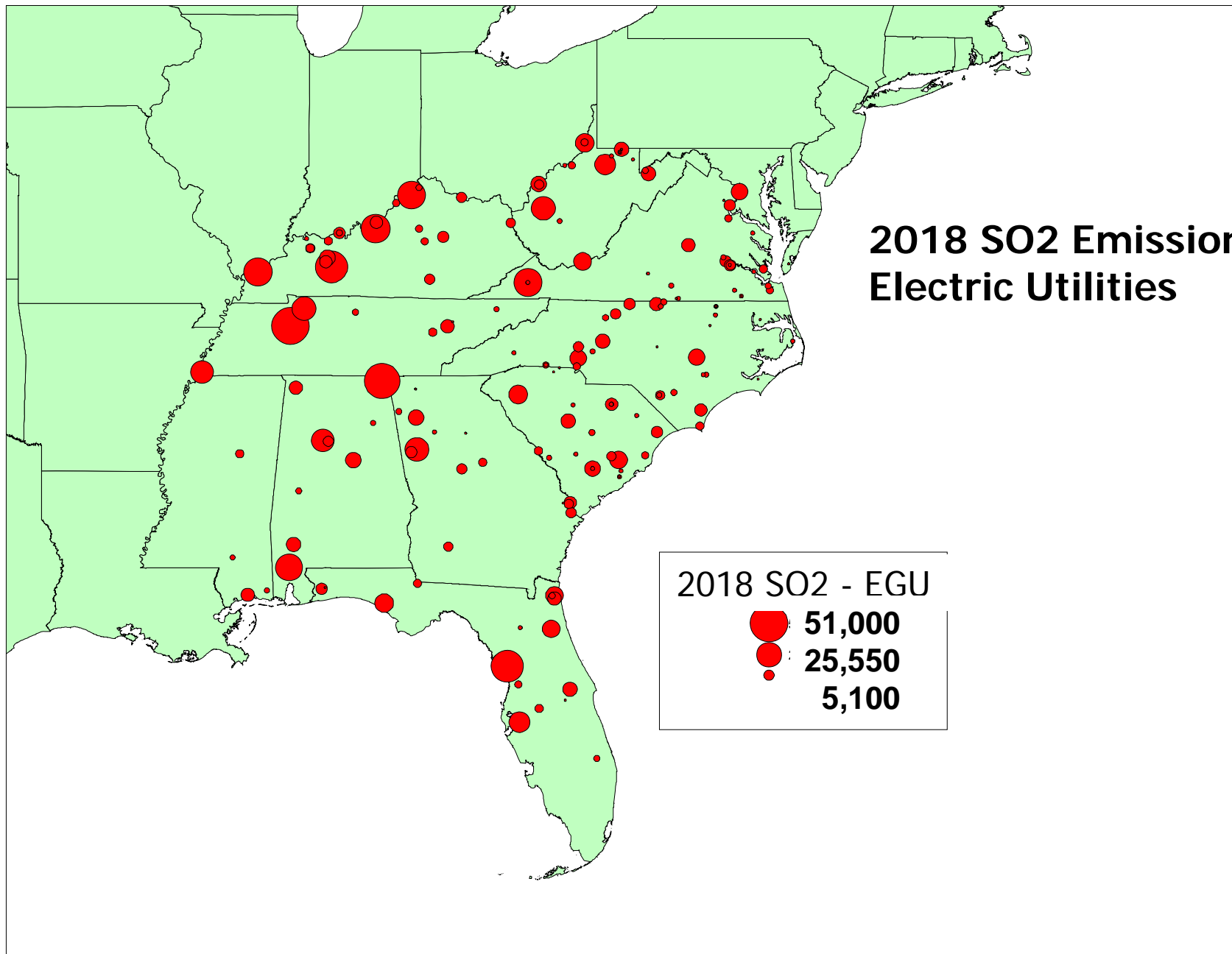
- Evaluated responses to emissions reductions for specific pollutants and source sectors
- Greatest visibility improvement from further reducing SO<sub>2</sub> emissions from utilities and industries

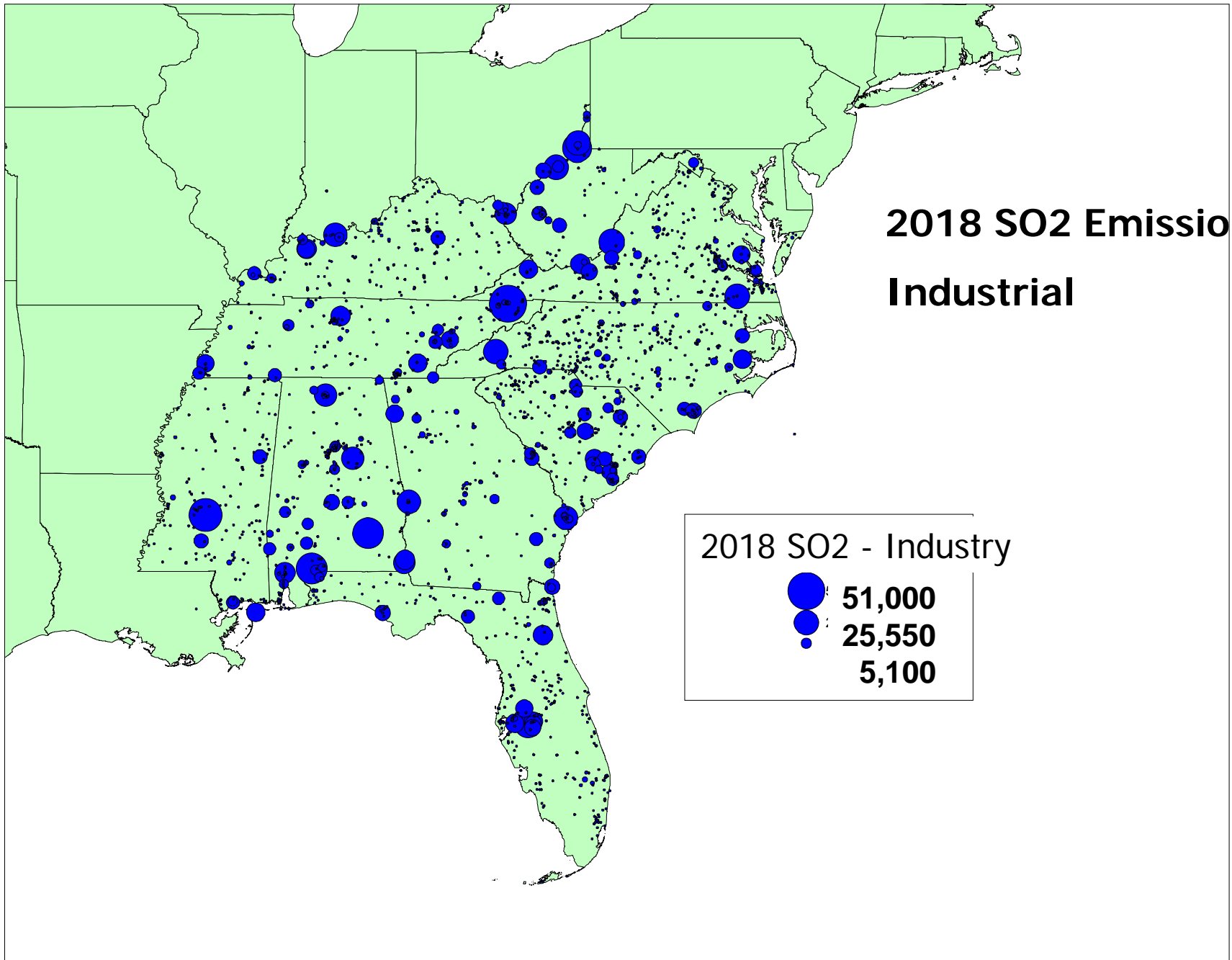
# Great Smoky Mountains, TN (Worst)



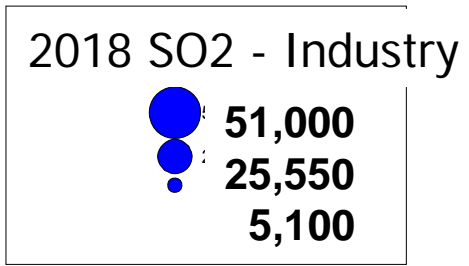
Greatest benefits from SO2 reductions from Utilities and Industries

## 2018 SO2 Emissions Electric Utilities





# 2018 SO2 Emissions Industrial



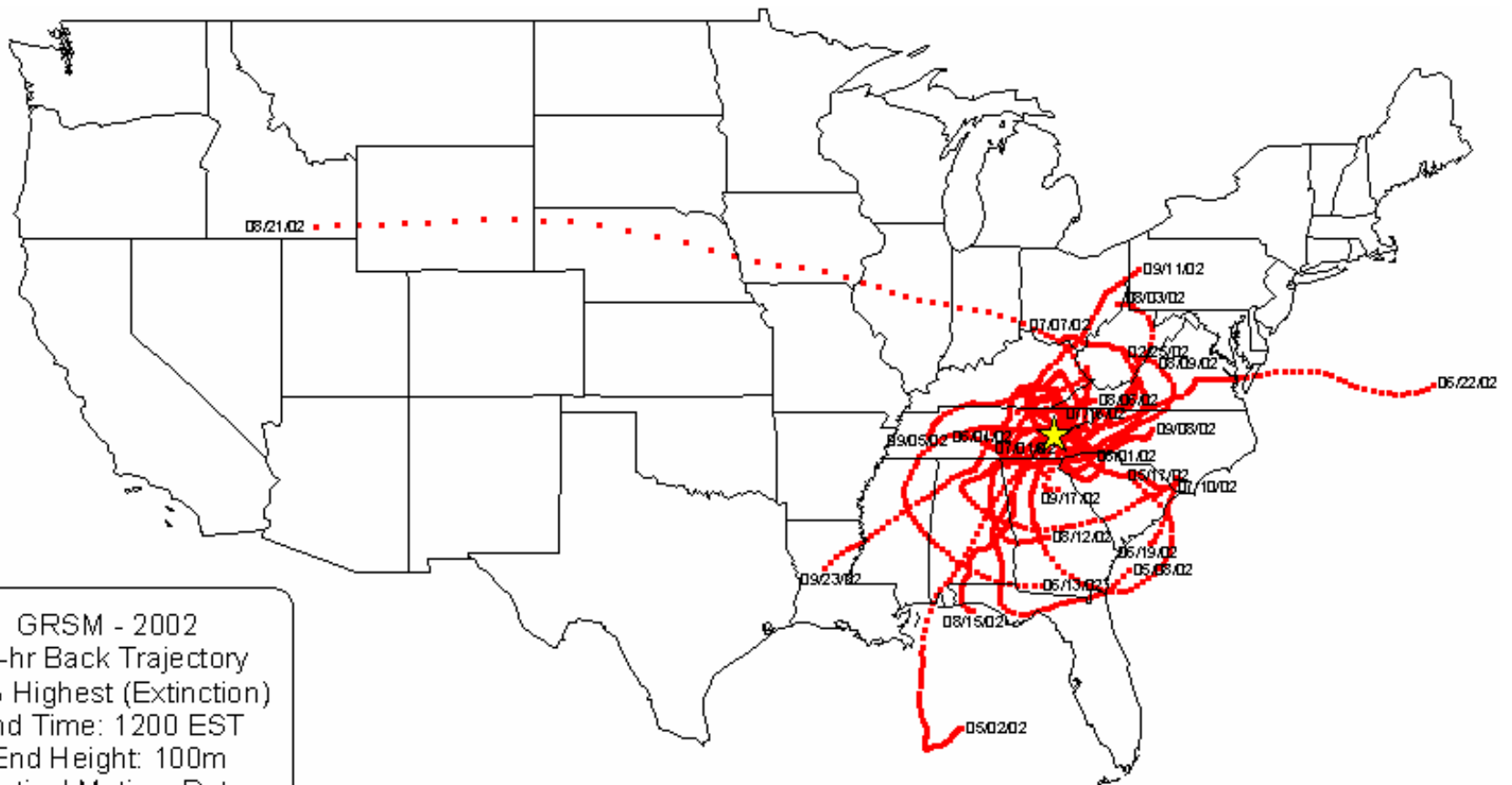


# VISTAS SO<sub>2</sub> Areas of Influence Analyses (2006)

---

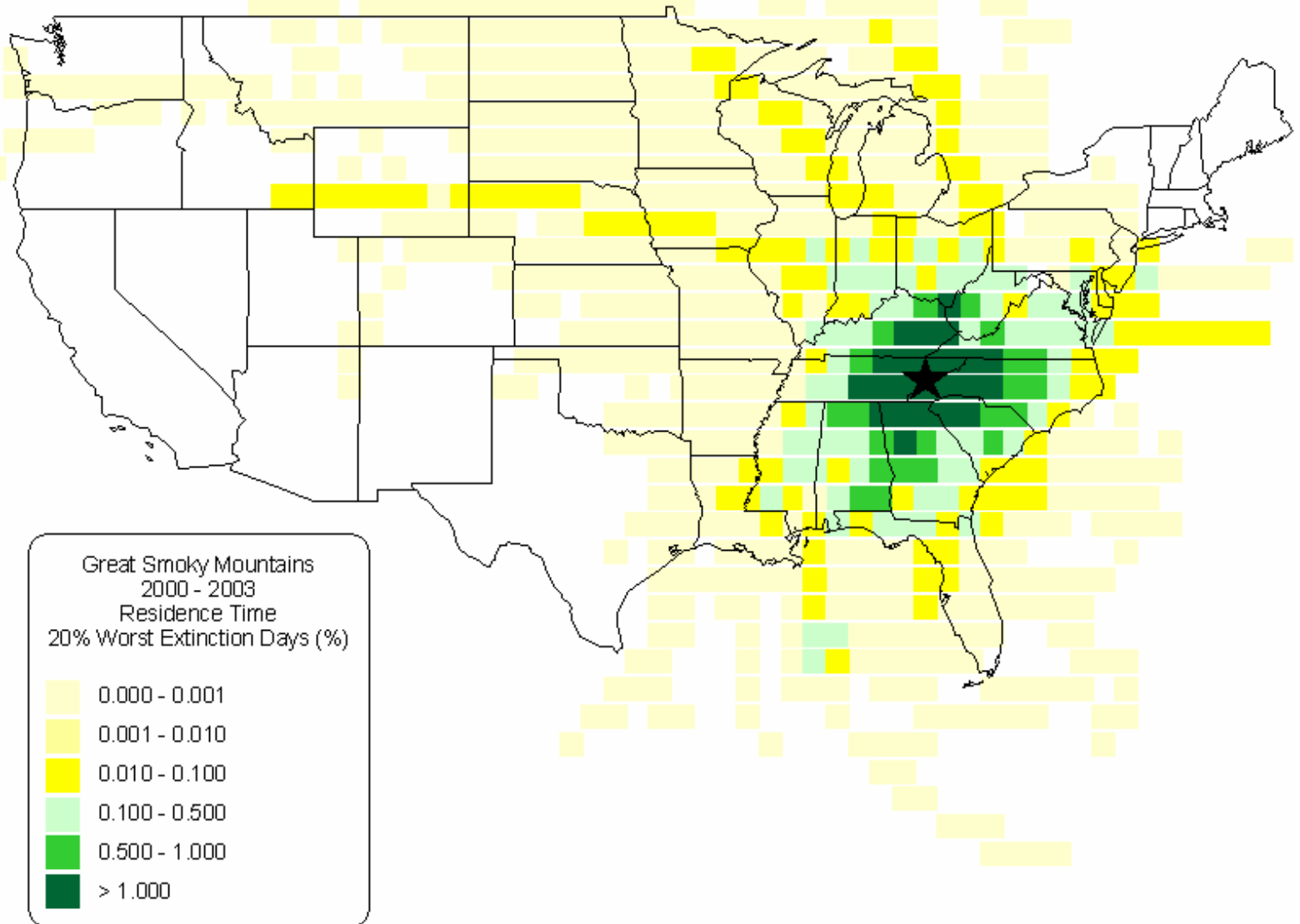
- Use wind trajectories to define geographic areas most likely to influence Class I areas on 20% worst days in 2000-2004
- Consider SO<sub>2</sub> emissions from EGU and non-EGU point sources in geographic Areas of Influence

# Back Trajectories for 20% Hazy Days for 2002 Great Smoky Mtns.

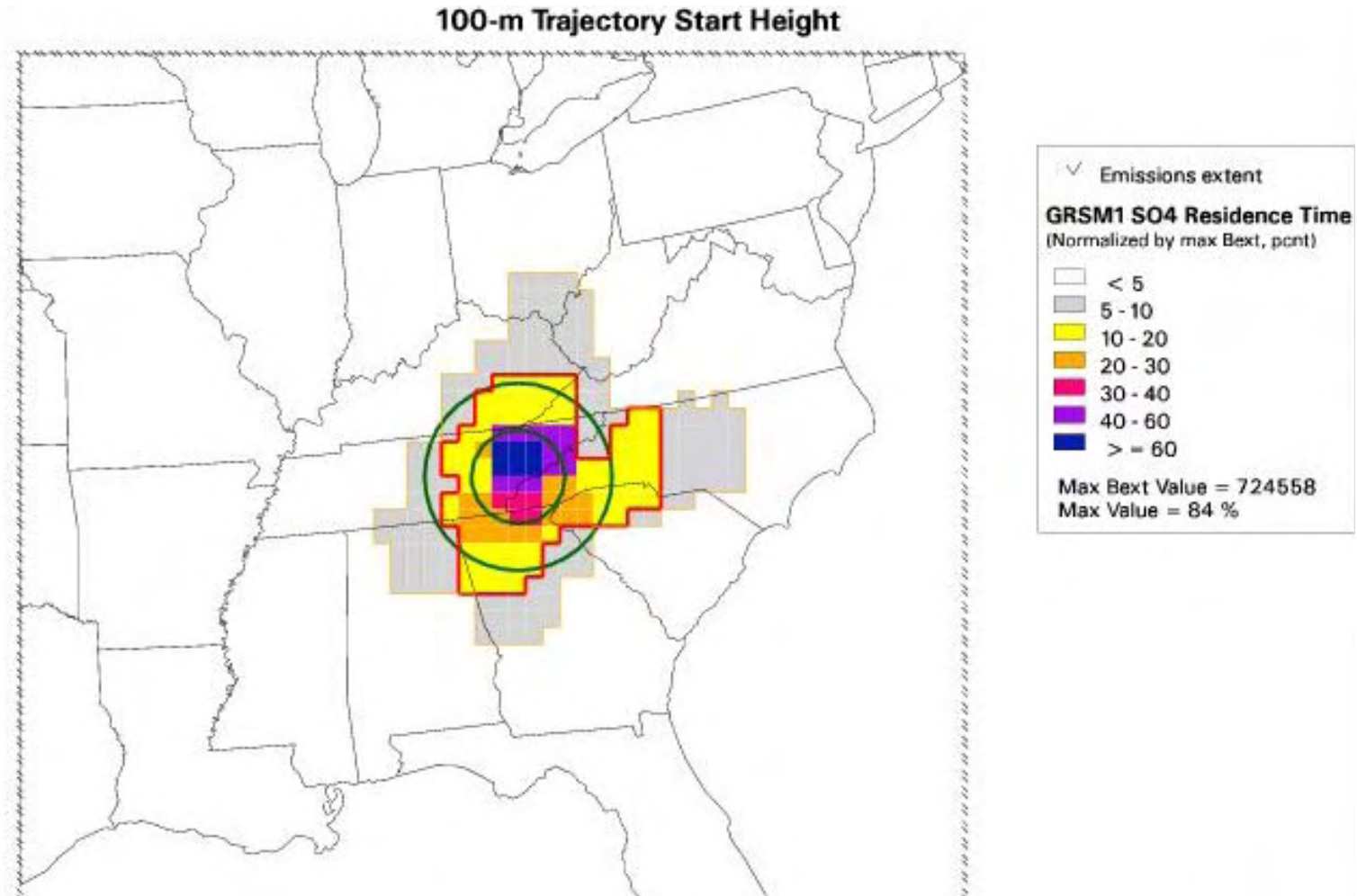


GRSM - 2002  
72-hr Back Trajectory  
20% Highest (Extinction)  
End Time: 1200 EST  
End Height: 100m  
Vertical Motion: Data  
★ Site Location

# Residence Time 2000-2003 – 20% Worst Days: Great Smoky Mtns.



# SO2 Area of Influence for Great Smoky Mountains



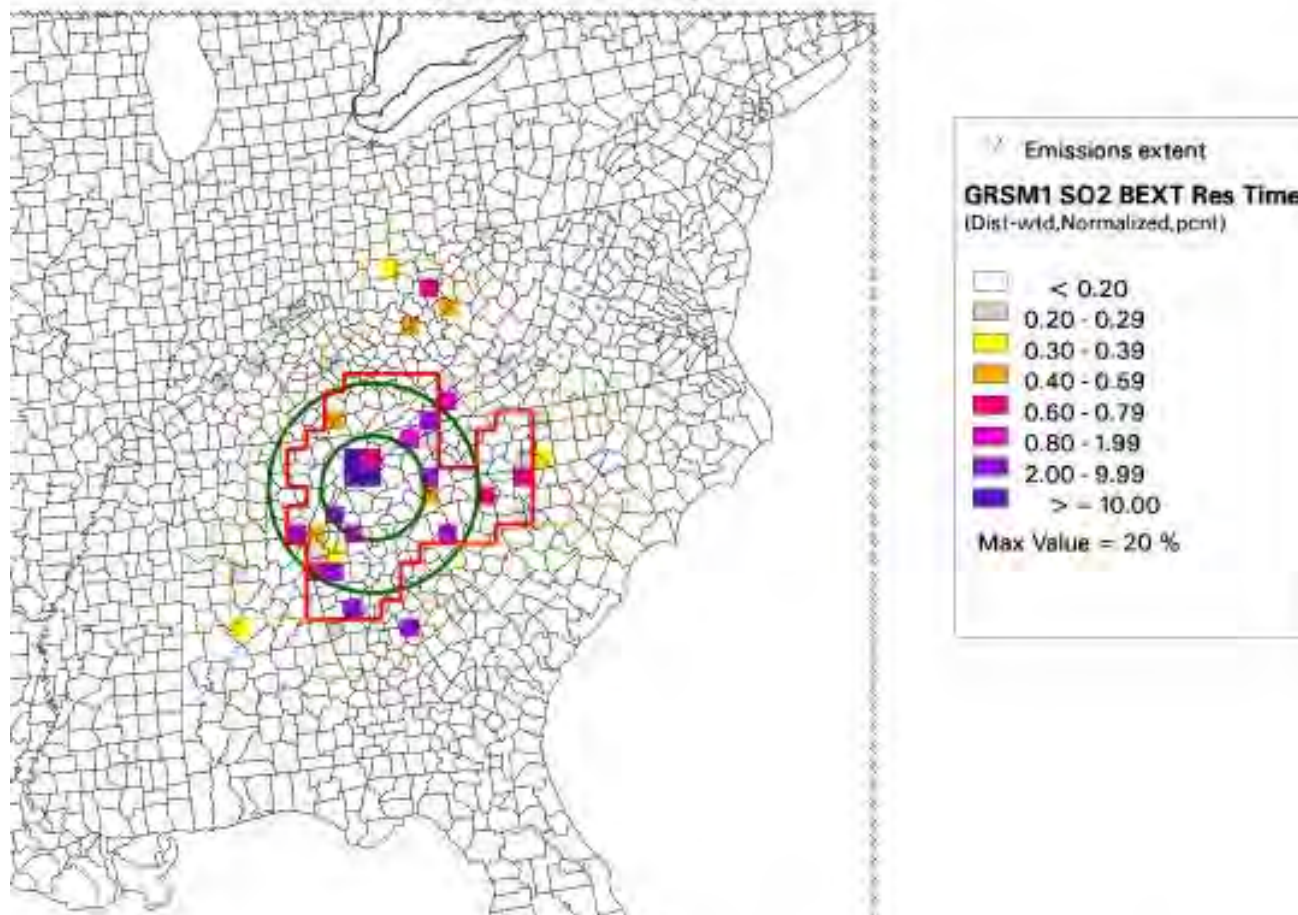
Green circles indicate 100-km and 200-km radii from Class I area.

Red line perimeter indicate Area of Influence with Residence Time  $\geq 10\%$

Orange line perimeter indicate Area of Influence with Residence Time  $\geq 5\%$ .

# 2018 SO<sub>2</sub> Emissions weighted by Residence Time Great Smoky Mtn., TN

100-m Trajectory Start Height



Green circles indicate 100-km and 200-km radii from Class I area.

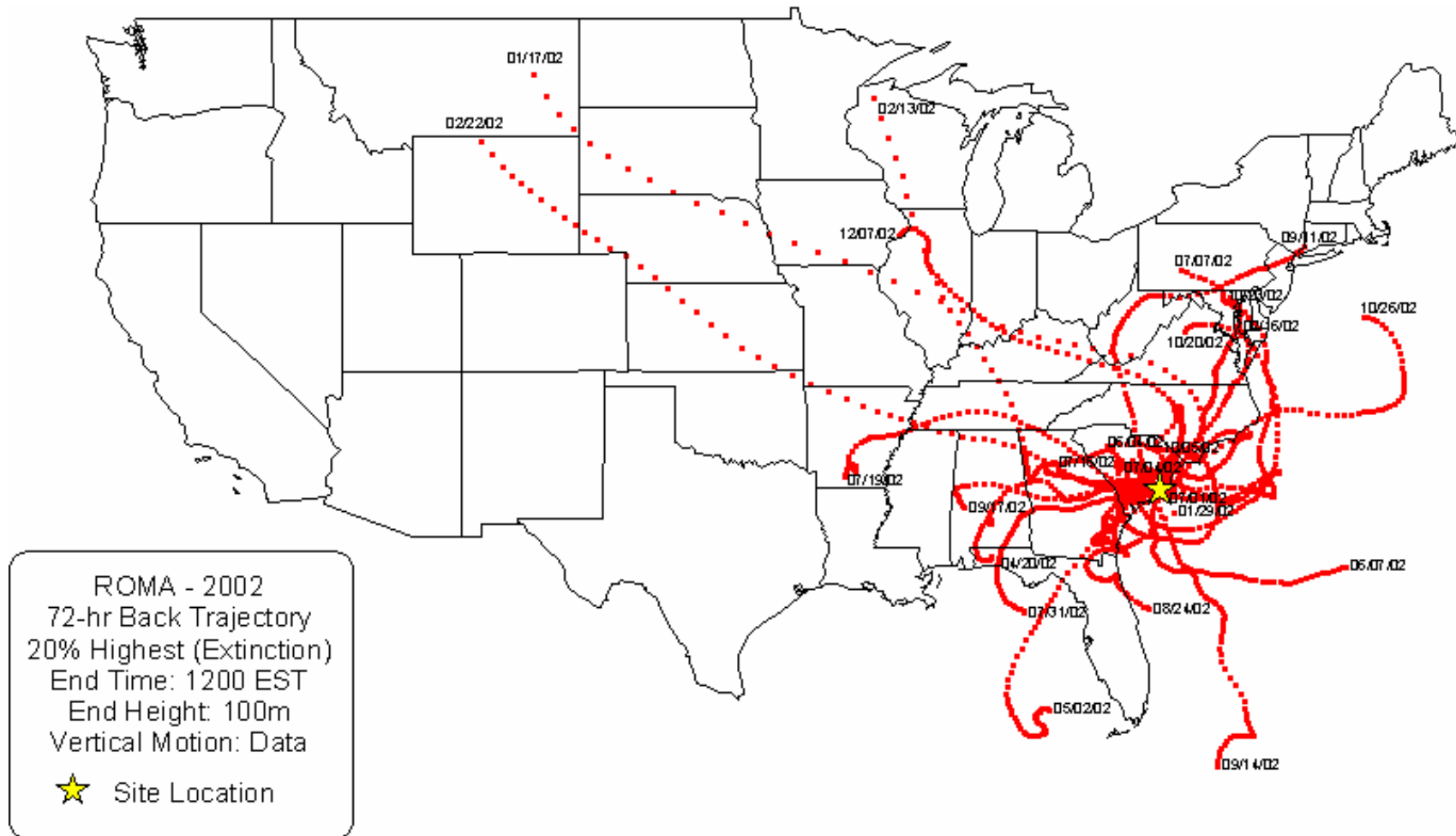
Red line perimeter indicate Area of Influence with Residence Time  $\geq 10\%$ .

Orange line perimeter indicate Area of Influence with Residence Time  $\geq 5\%$ .

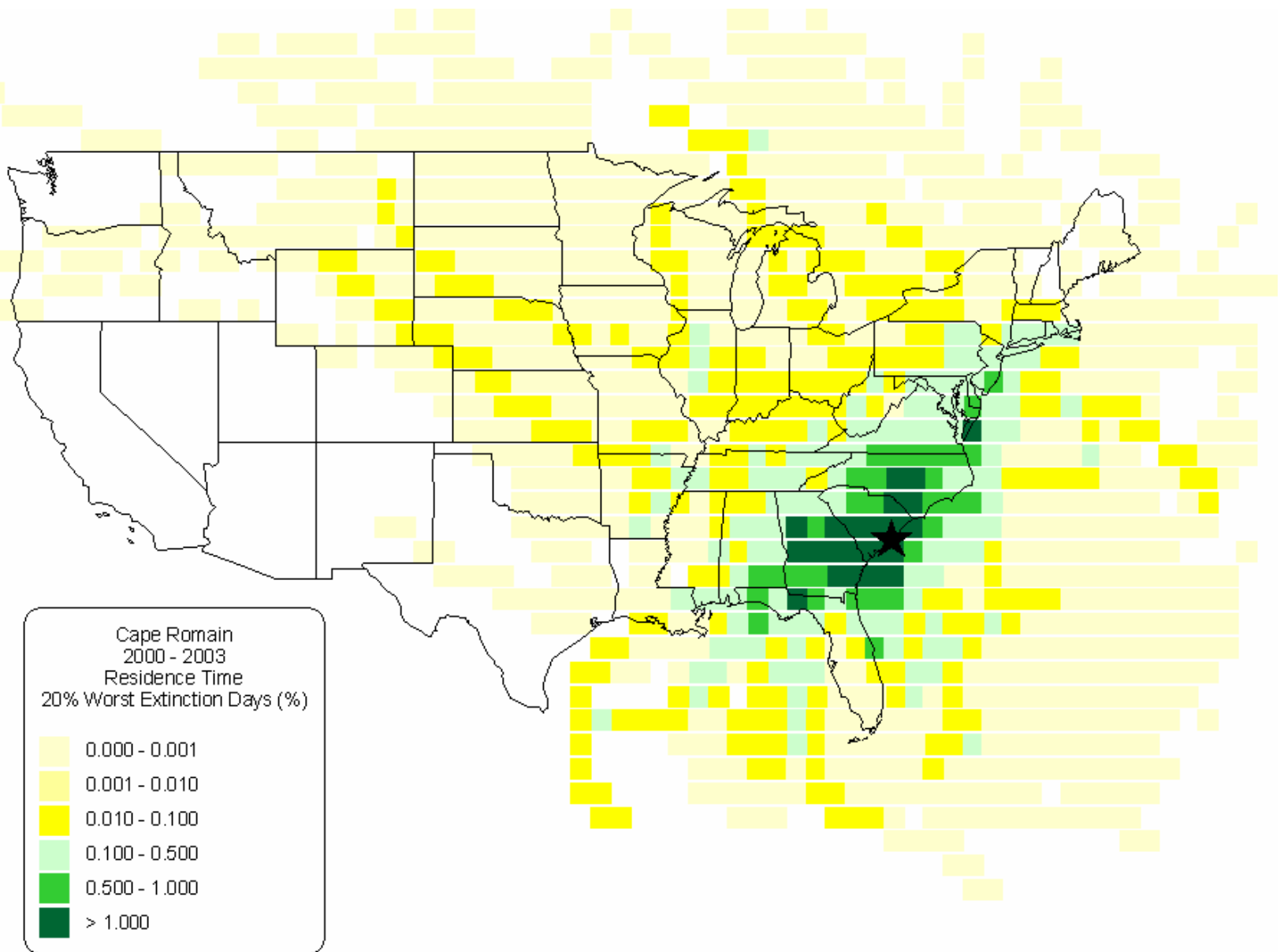
# Annual 2018 BaseG2 Emissions (%) Within Area of Influence Great Smoky Mountains, TN

Tier	VOC	NOX	CO	SO2	PM-10	PM-2.5	NH3
<b>Fuel Comb. Elec. Util.</b>	0%	22%	1%	<b>54%</b>	11%	21%	1%
<b>Fuel Comb. Industrial</b>	1%	18%	2%	<b>30%</b>	3%	5%	0%
Fuel Comb. Other	5%	6%	3%	<b>6%</b>	5%	12%	1%
Chem & Allied Product	2%	0%	0%	<b>2%</b>	1%	1%	0%
Metals Processing	1%	1%	2%	<b>3%</b>	2%	5%	0%
Petroleum & Related Industries	0%	0%	0%	1%	0%	0%	0%
Other Industrial Processes	6%	5%	1%	<b>3%</b>	8%	11%	0%
Solvent Utilization	44%	1%	0%	0%	0%	1%	0%
Storage & Transport	6%	0%	0%	0%	0%	1%	0%
Waste Disposal & Recycling	4%	2%	3%	0%	5%	11%	0%
Highway Vehicles	18%	<b>25%</b>	48%	0%	2%	2%	11%
Off-highway	11%	<b>18%</b>	35%	1%	2%	4%	0%
Miscellaneous (e.g. Agriculture, Forest Fires)	1%	1%	5%	0%	<b>59%</b>	<b>26%</b>	<b>86%</b>

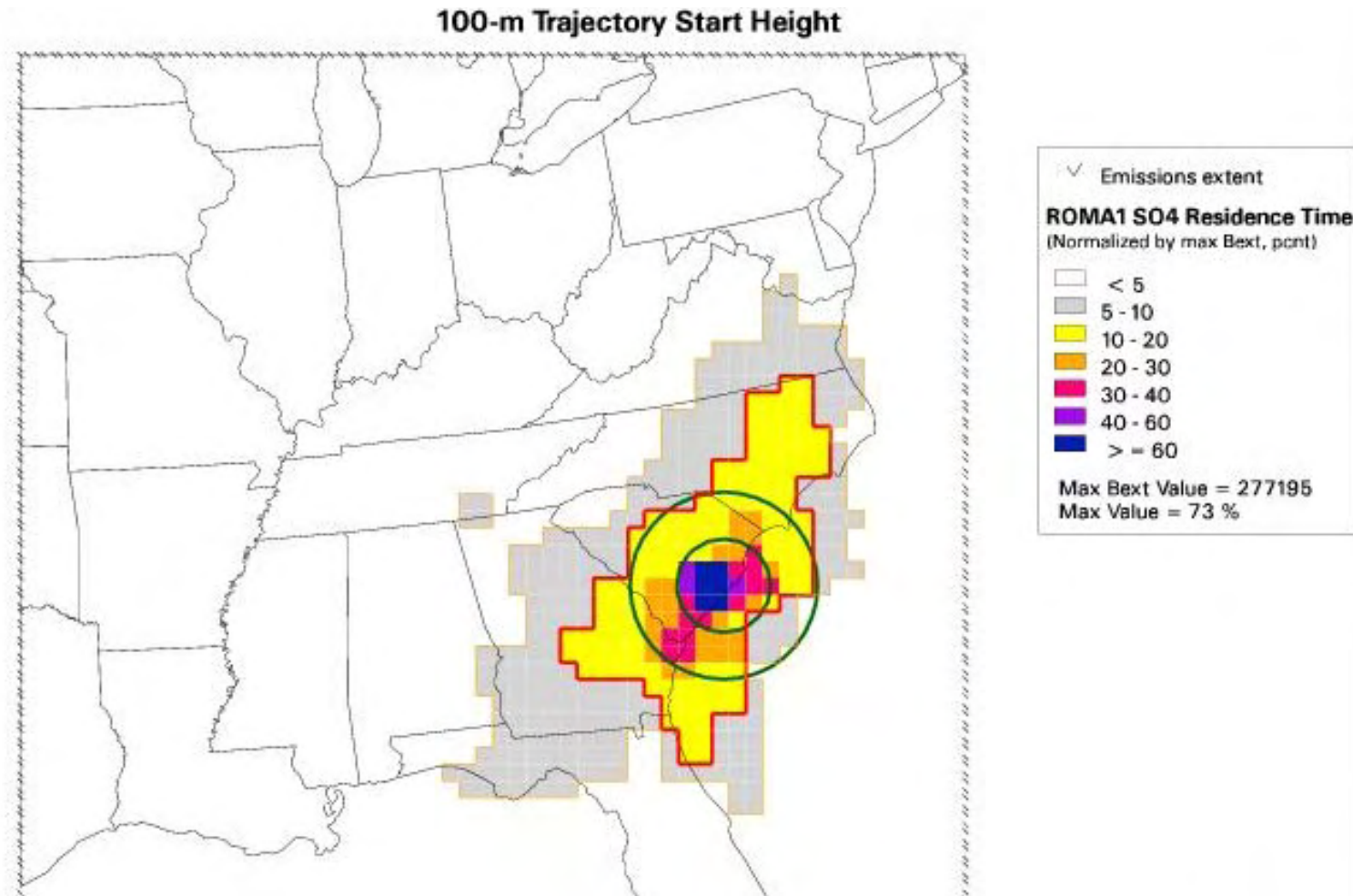
# Back Trajectories for 20% Worst Days for 2002 Cape Romain, SC



# Residence Time for 20% Worst Days in 2000-2003 – Cape Romain, SC



# SO2 Area of Influence for Cape Romain, SC

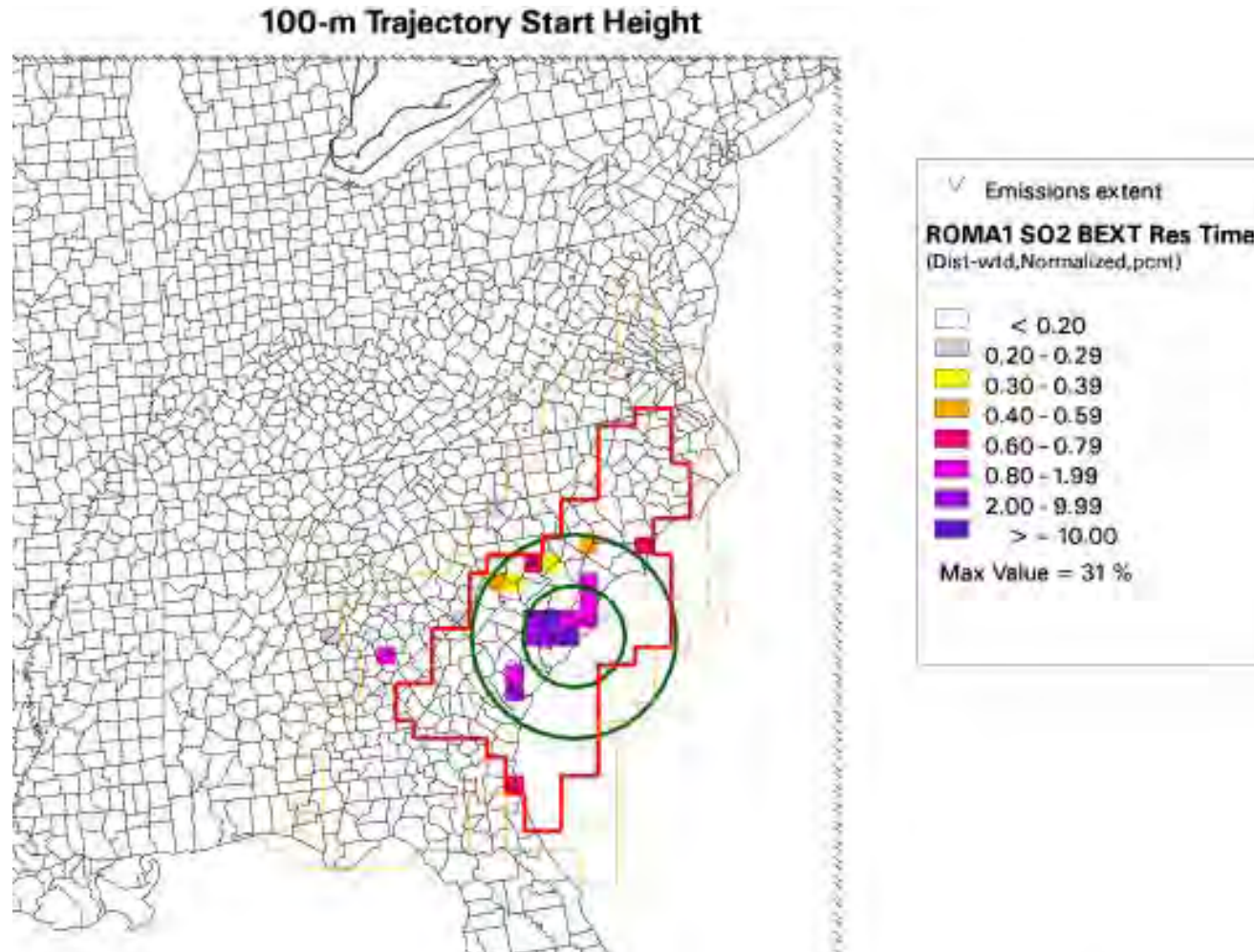


Green circles indicate 100-km and 200-km radii from Class I area.

Red line perimeter indicate Area of Influence with Residence Time  $\geq 10\%$

Orange line perimeter indicate Area of Influence with Residence Time  $\geq 5\%$ .

# 2018 SO<sub>2</sub> Emissions weighted by Residence Time Cape Romain, SC



Green circles indicate 100-km and 200-km radii from Class I area.

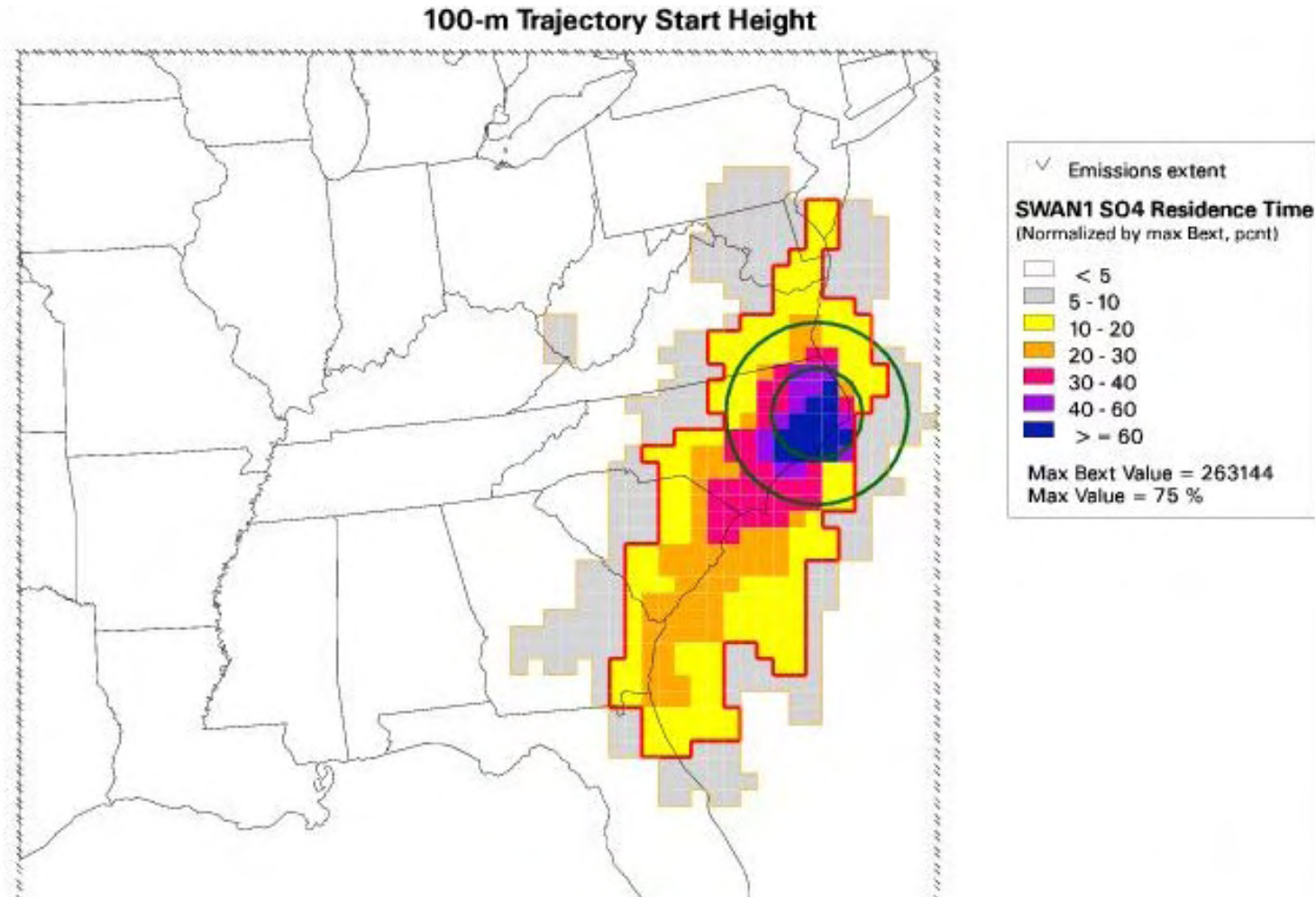
Red line perimeter indicate Area of Influence with Residence Time  $\geq 10\%$ .

Orange line perimeter indicate Area of Influence with Residence Time  $\geq 5\%$ .

# Annual 2018 BaseG2 Emissions (%) Within Area of Influence Cape Romain, SC

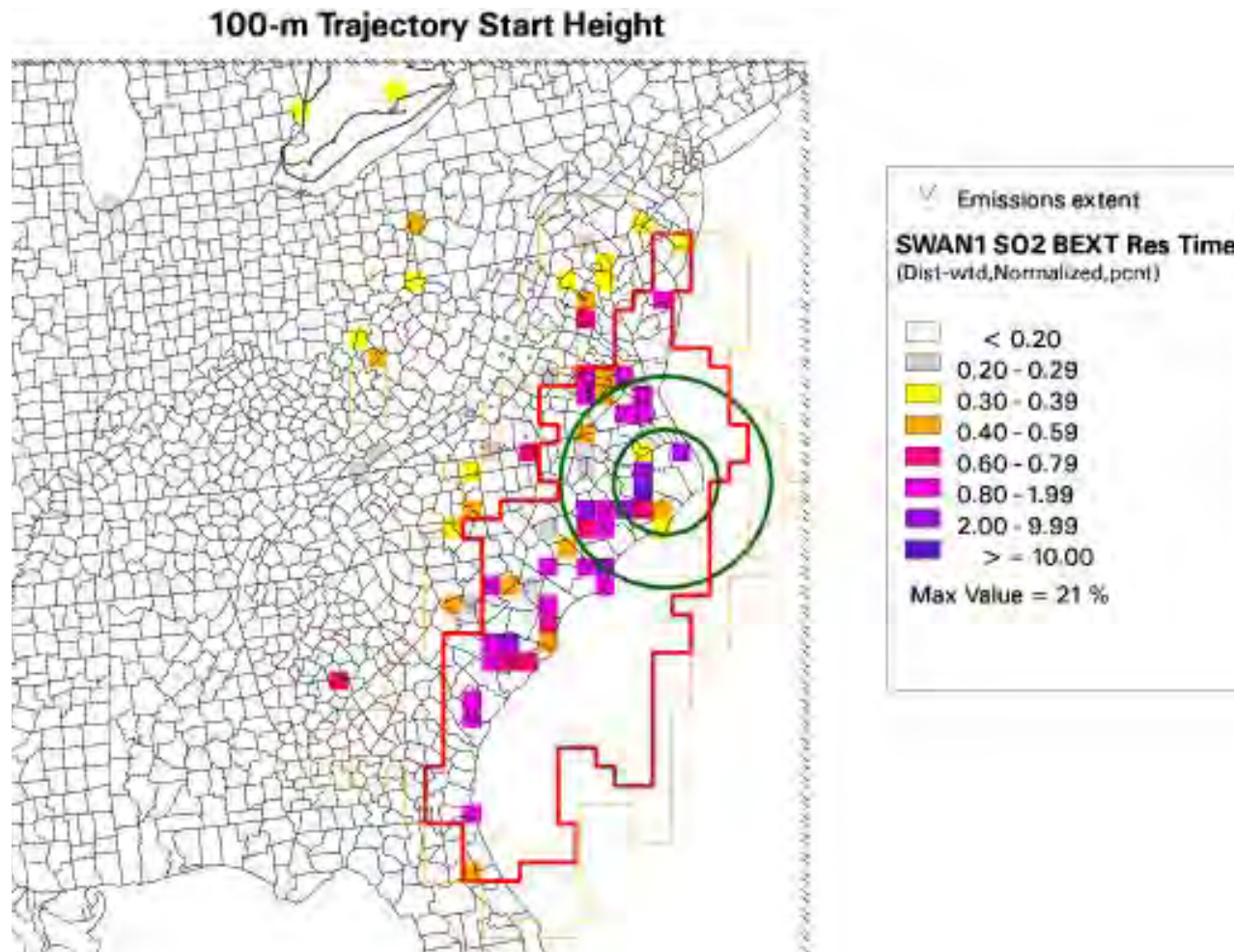
Tier	VOC	NOX	CO	SO2	PM-10	PM-2.5	NH3
<b>Fuel Comb. Elec. Util.</b>	0%	20%	1%	<b>46%</b>	8%	16%	1%
<b>Fuel Comb. Industrial</b>	1%	17%	2%	<b>34%</b>	3%	5%	0%
<b>Fuel Comb. Other</b>	4%	5%	2%	<b>6%</b>	4%	7%	1%
<b>Chemical &amp; Allied Product Mfg</b>	1%	1%	0%	<b>4%</b>	1%	1%	1%
Metals Processing	0%	0%	0%	1%	0%	0%	0%
Petroleum & Related Industries	0%	0%	0%	0%	0%	0%	0%
<b>Other Industrial Processes</b>	6%	6%	1%	<b>6%</b>	8%	9%	2%
Solvent Utilization	40%	0%	0%	0%	0%	0%	0%
Storage & Transport	7%	0%	0%	0%	0%	1%	0%
Waste Disposal & Recycling	4%	3%	7%	1%	7%	15%	0%
Highway Vehicles	19%	25%	41%	1%	1%	1%	11%
Off-highway	14%	19%	32%	1%	2%	4%	0%
Miscellaneous	4%	3%	14%	1%	65%	40%	84%

# SO2 Area of Influence for Swanquarter, NC



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

# 2018 SO2 Emissions weighted by Residence Time Swanquarter, NC



Green circles indicate 100-km and 200-km radii from Class I area.

Red line perimeter indicate Area of Influence with Residence Time  $\geq 10\%$ .

Orange line perimeter indicate Area of Influence with Residence Time  $\geq 5\%$ .



# Reasonable Progress Analysis

---

- States consider 4 Statutory Factors to determine what controls are reasonable
  - Costs of Compliance
  - Time to Comply
  - Remaining Useful Life
  - Energy and Other Environmental and Impacts



# VISTAS 2007 Schedule

---

- States define sources for which 4 statutory factors will be analyzed.
- VISTAS 2018 Long Term Strategy run in summer 2007
  - CAIR, BART, and controls for reasonable further progress
- States are consulting with Federal Land Managers, EPA, neighboring RPOs, public
- States submit SIP December 2007

