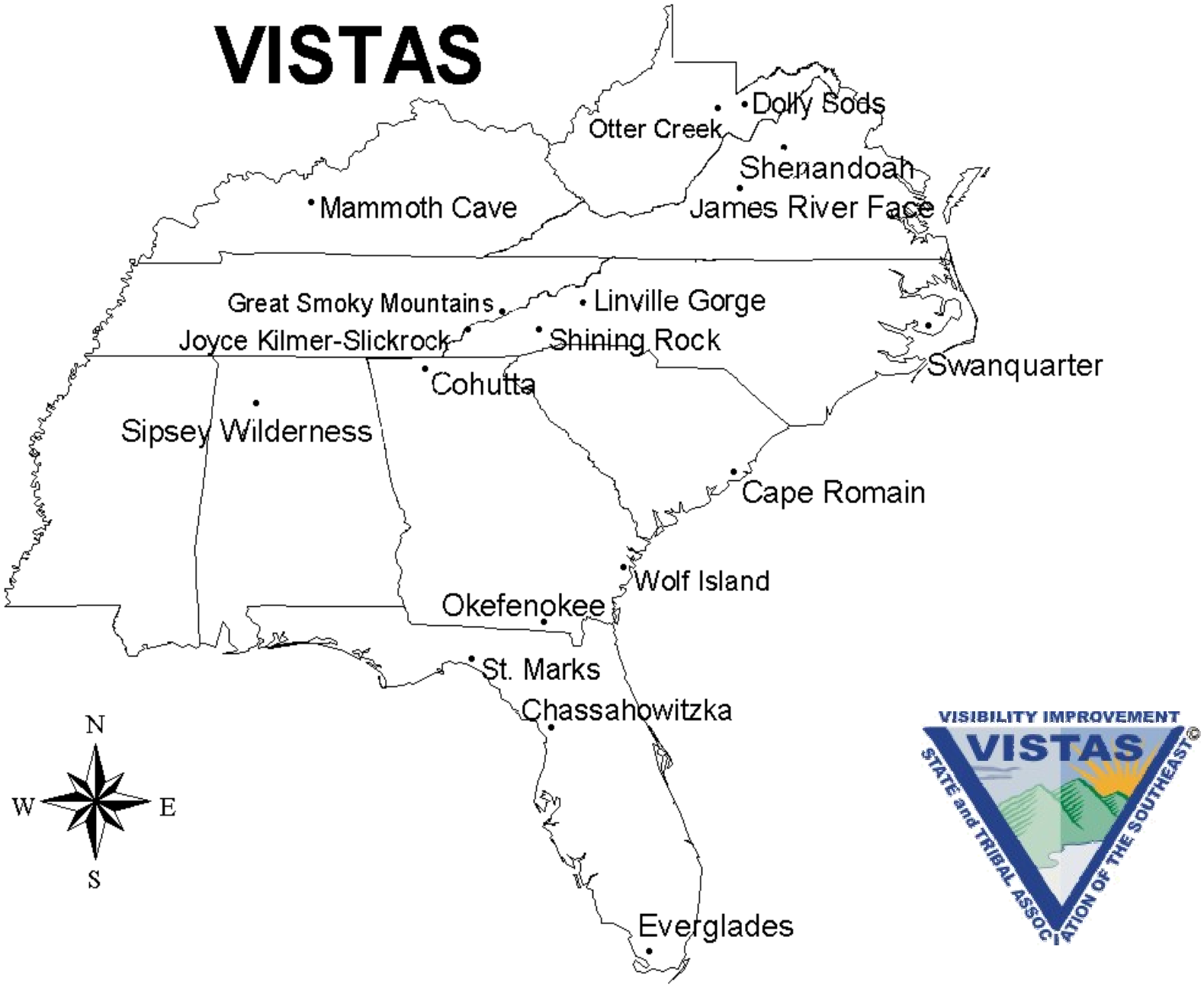
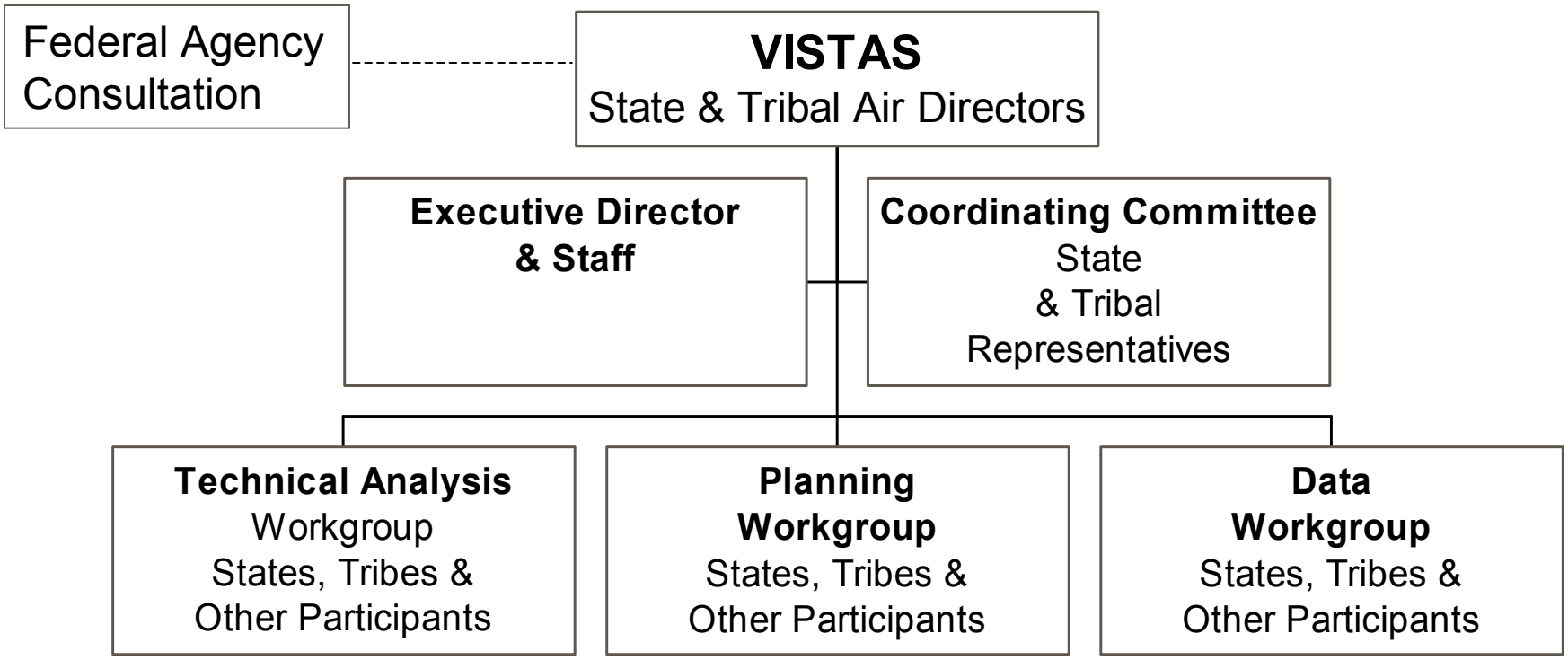
From VISTAS to MANE-VU

Our Report on Southeastern Data

MANE-VU Data Analysis Workshop
June 18, 2003


VISTAS
Dolly Sods
Otter Creek
Shenandoah
James River Face
Mammoth Cave
Great Smoky Mountains
Linville Gorge
Joyce Kilmer-Slickrock
Shining Rock
Swanquarter
Cohutta
Sipsey Wilderness
Cape Romain
Wolf Island
Okefenokee
St. Marks
Chassahowitzka
Everglades
N
W
E
S
VISIBILITY IMPROVEMENT
VISTAS
STATE and TRIBAL ASSOCIATION OF THE SOUTHEAST©

VISTAS Organizational Chart

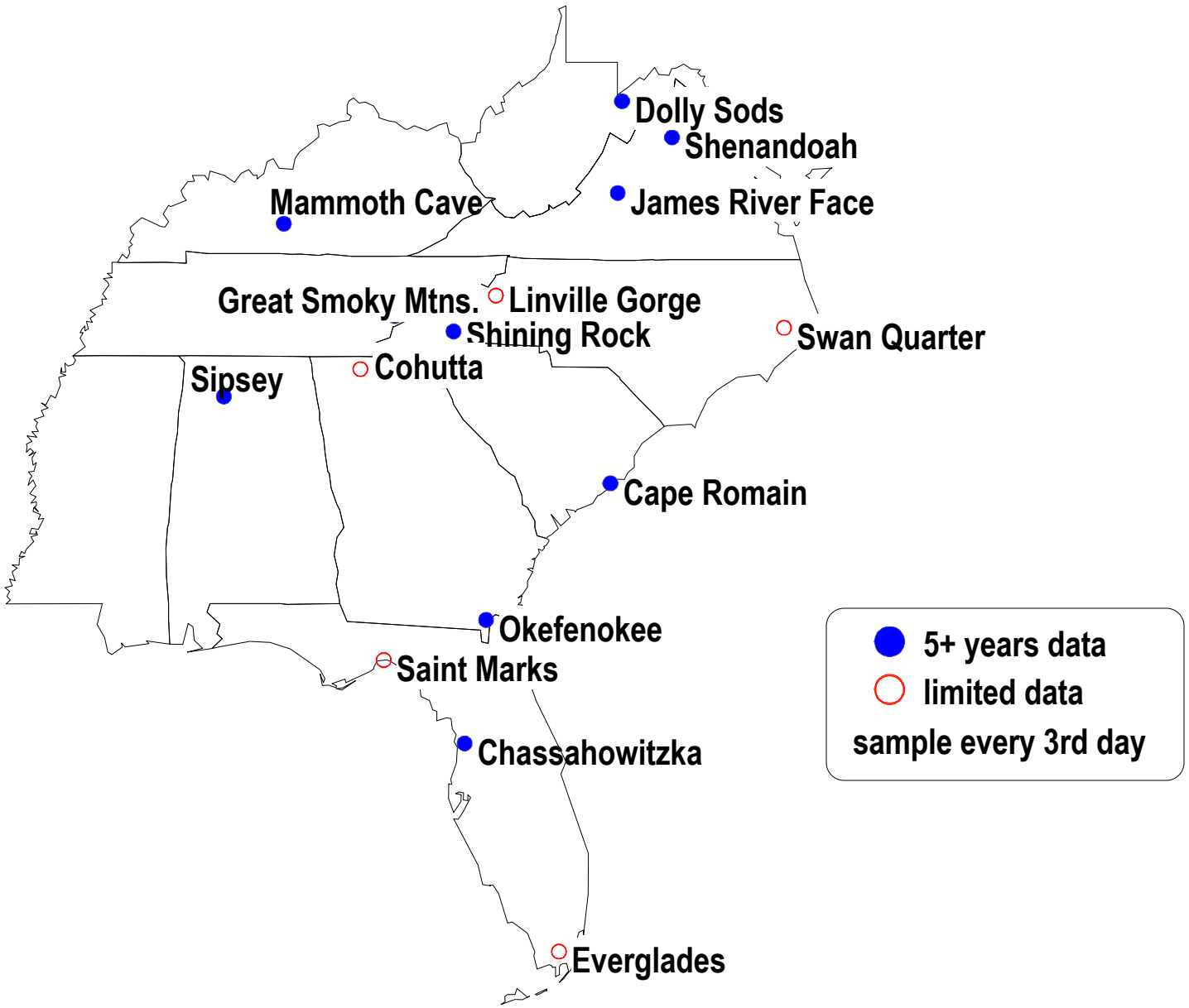


VISTAS Data Analysis

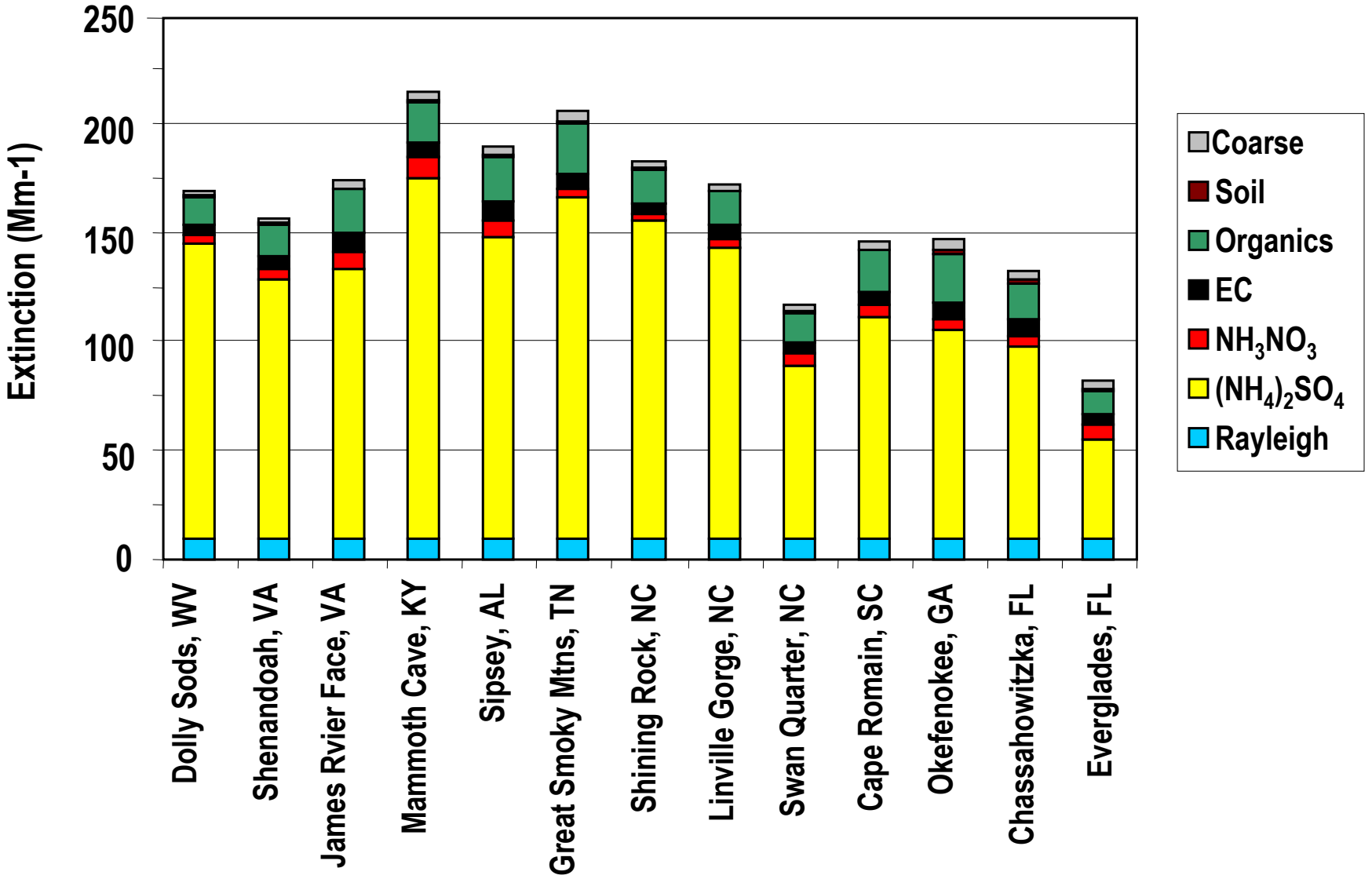
- Contractor: Air Resource Specialists
  - ✓ Defined components contributing to $PM_{2.5}$ and visibility in Southeastern US, 1998-2002
    - ✓ IMPROVE, SEARCH, STN, AIRS
  - ✓ Evaluated role of fire, Saharan dust
  - ✓ Evaluated source areas on high and low visibility days
  - ✓ Evaluated contributions from VISTAS region to Class I areas in neighboring states
  - ✓ Identified data gaps and recommended next steps

http://www.vistas-sesarm.org/data/dataanalysis.htm

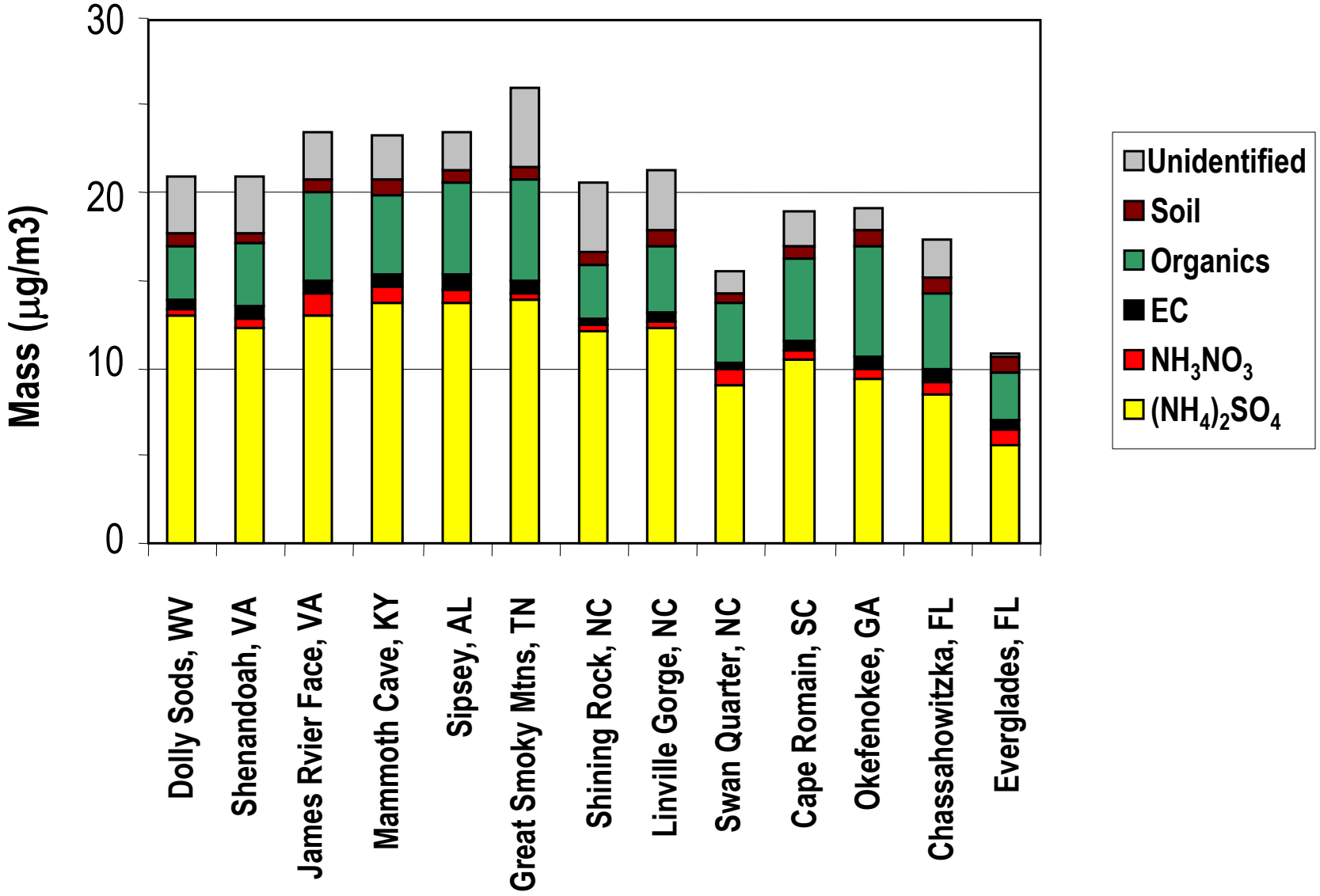
IMPROVE Sites in VISTAS region



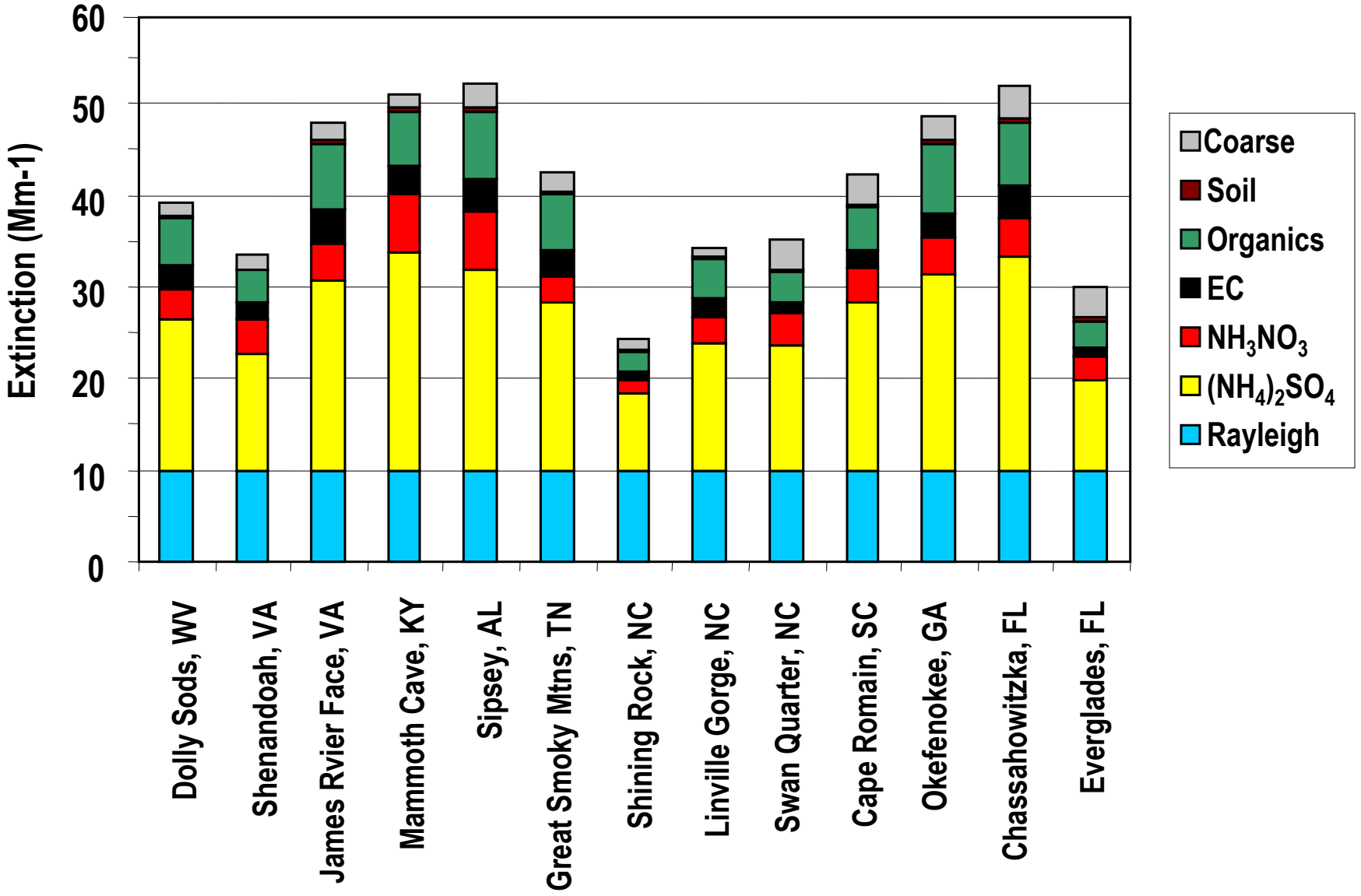
Light Extinction on 20% Poorest Visibility Days - IMPROVE 1998 - 2001



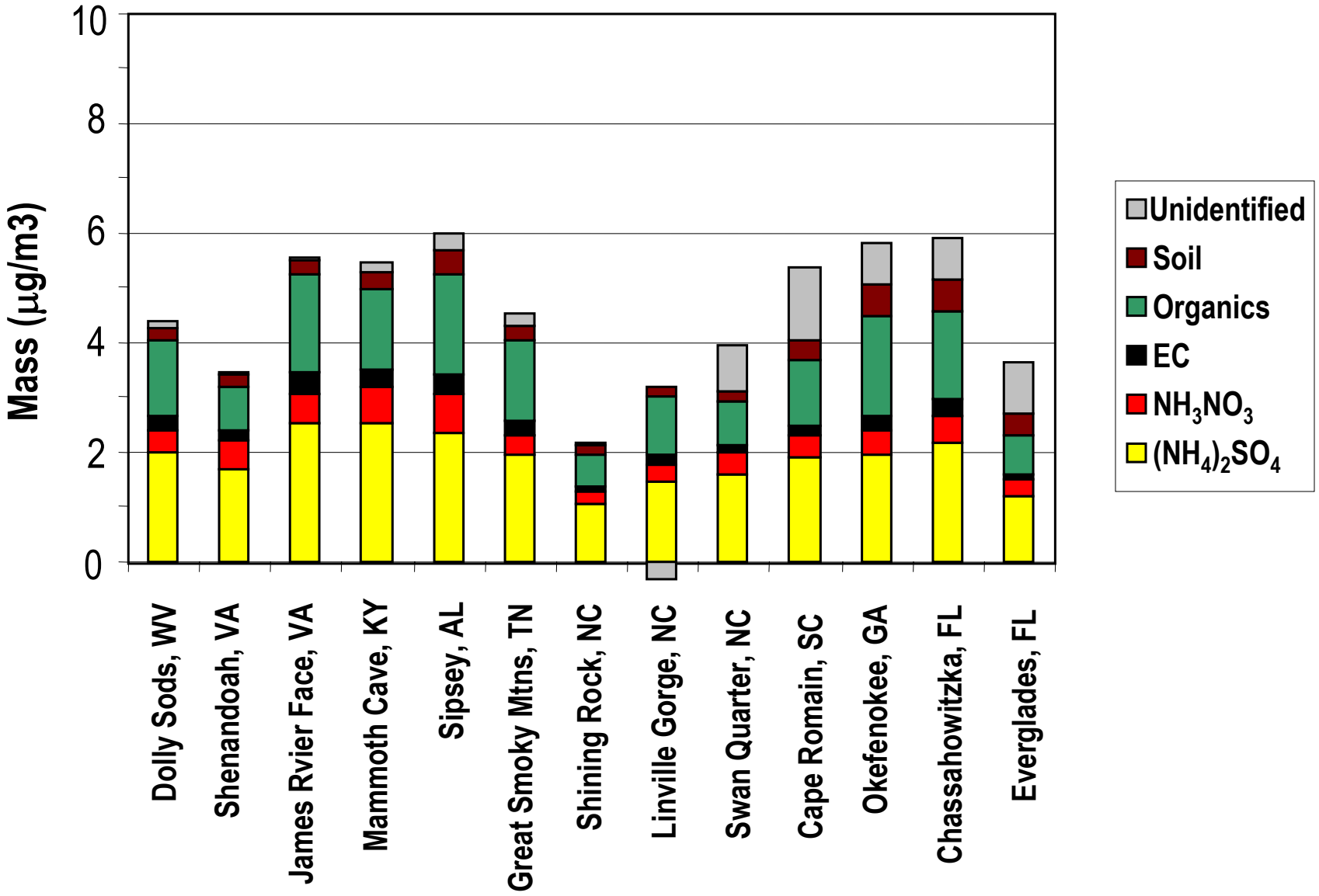
Fine Mass on 20% Poorest Visibility Days - IMPROVE 1998 - 2001



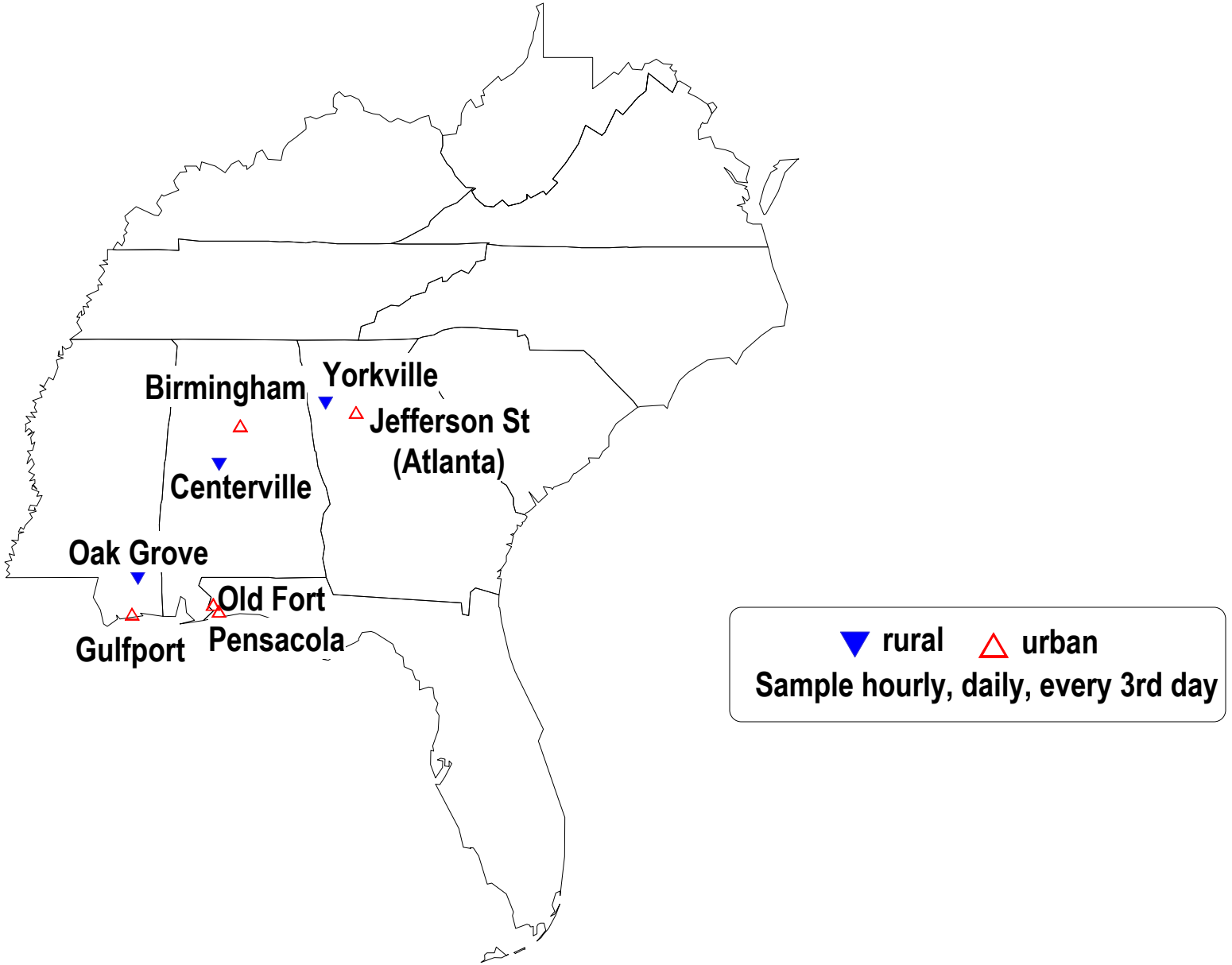
Light Extinction on 20% Best Visibility Days - IMPROVE 1998 - 2001



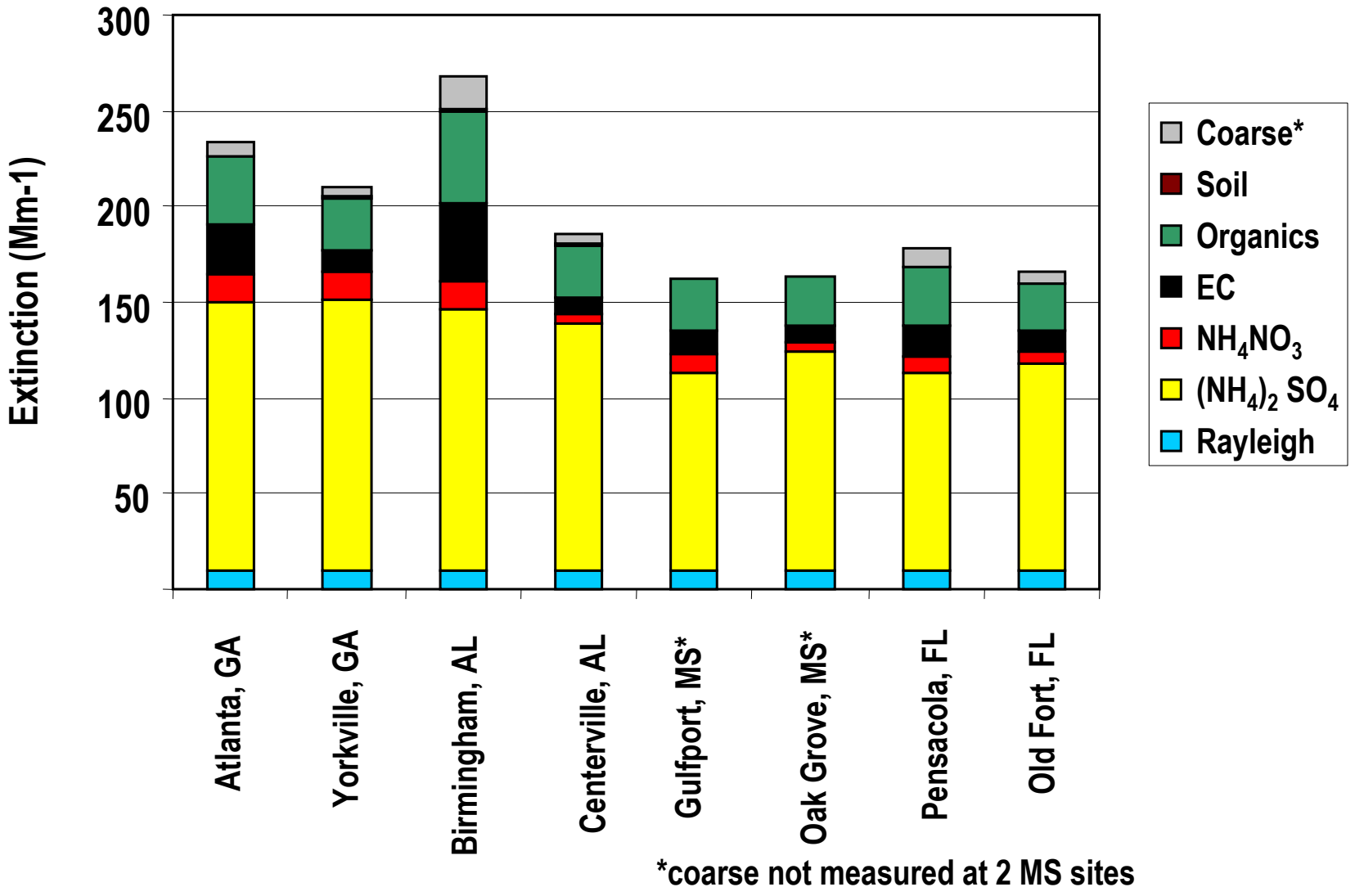
Fine Mass on 20% Best Visibility Days - IMPROVE 1998 - 2001



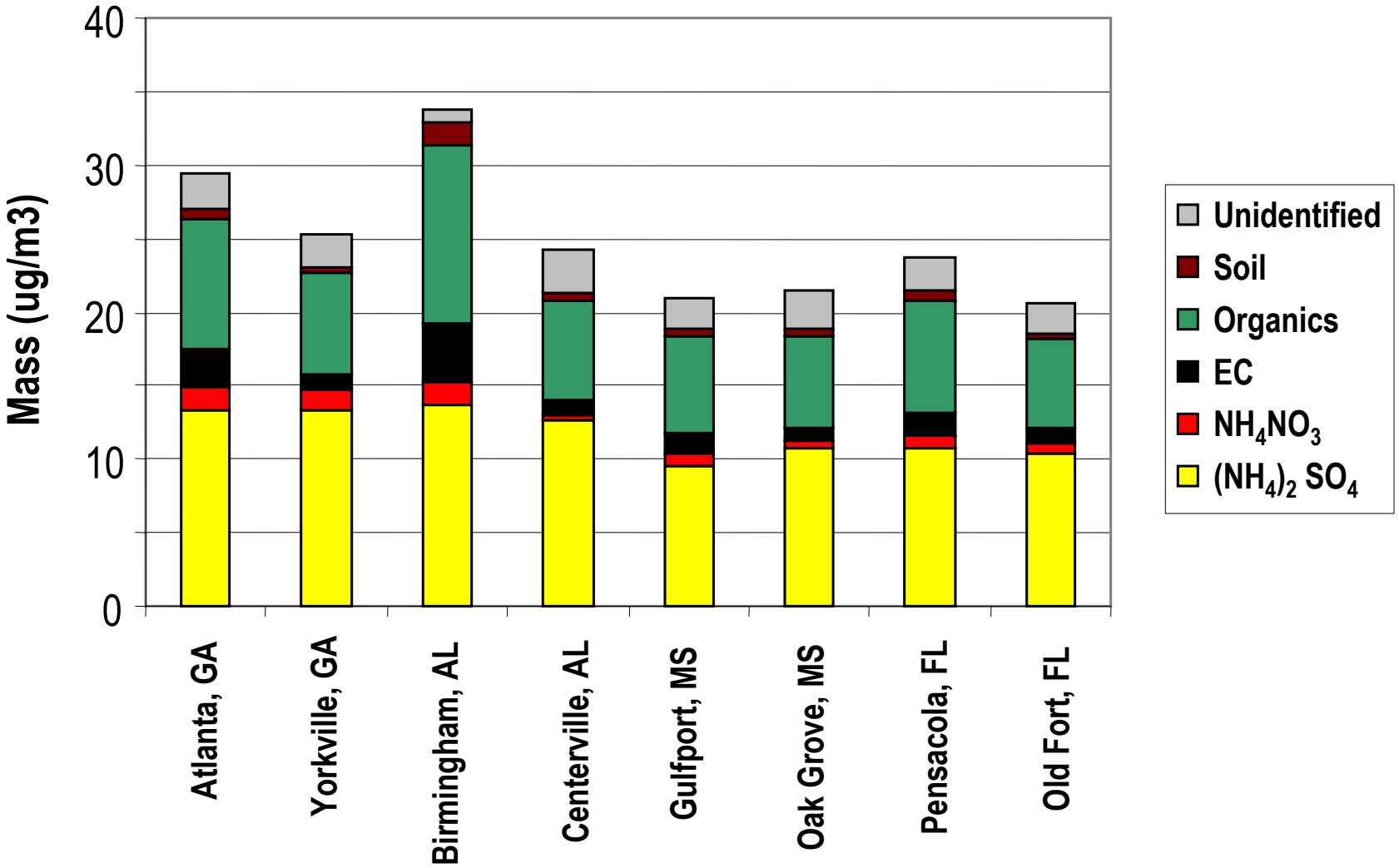
SEARCH Sites in VISTAS region



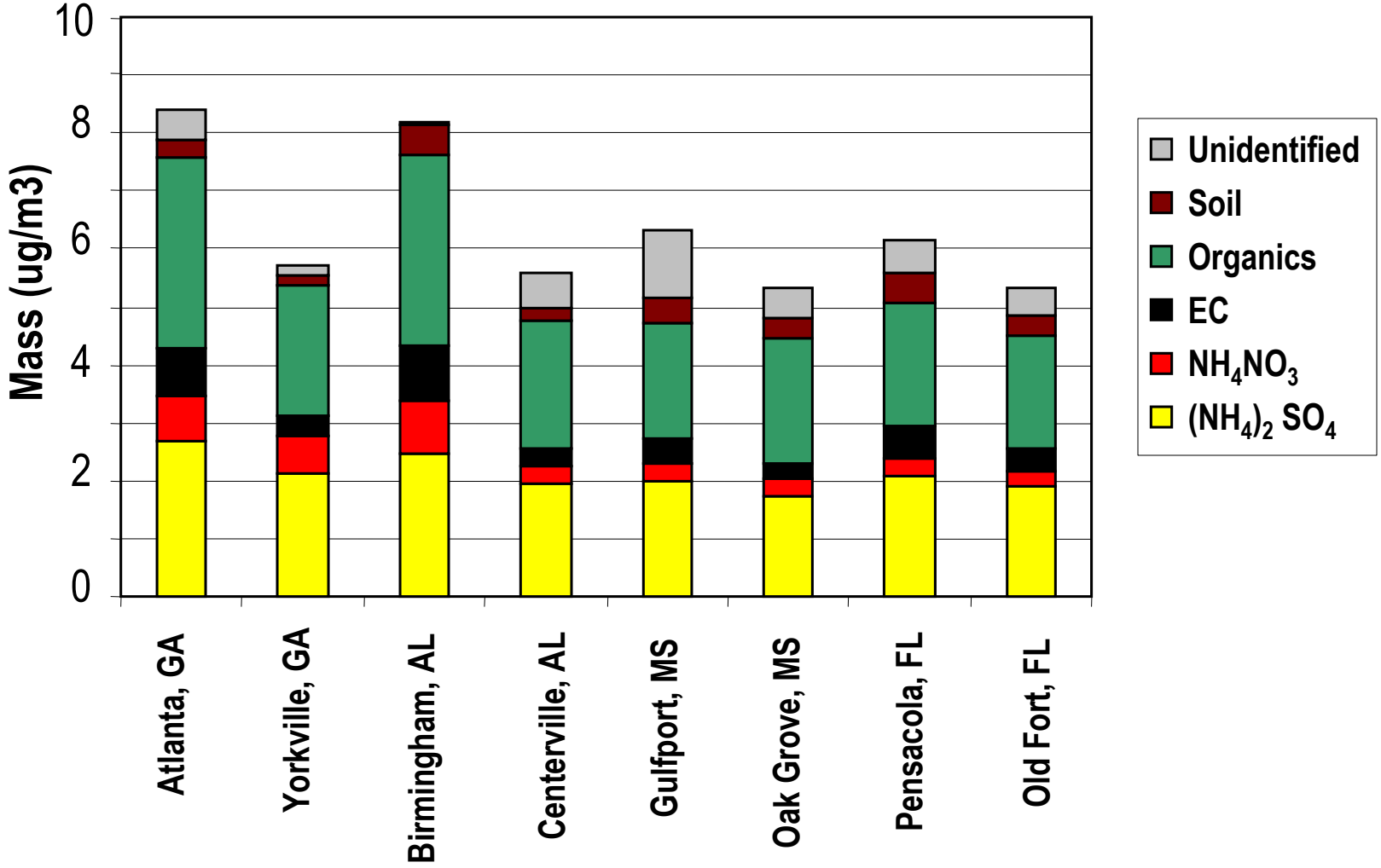
Light Extinction on 20% Poorest Visibility Days - SEARCH 1999 - 2001



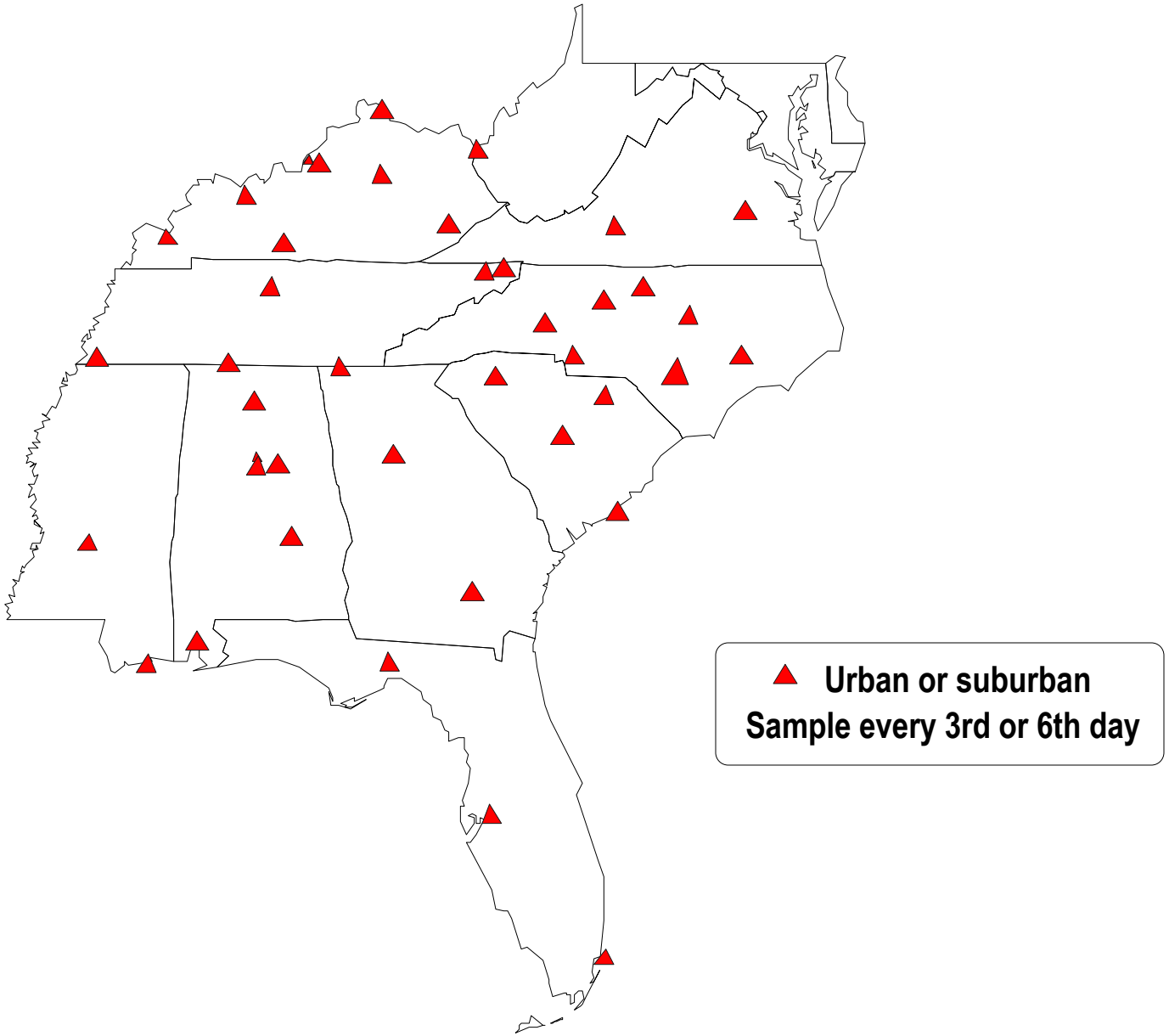
Fine Mass on 20% Poorest Visibility Days - SEARCH 1999 - 2001



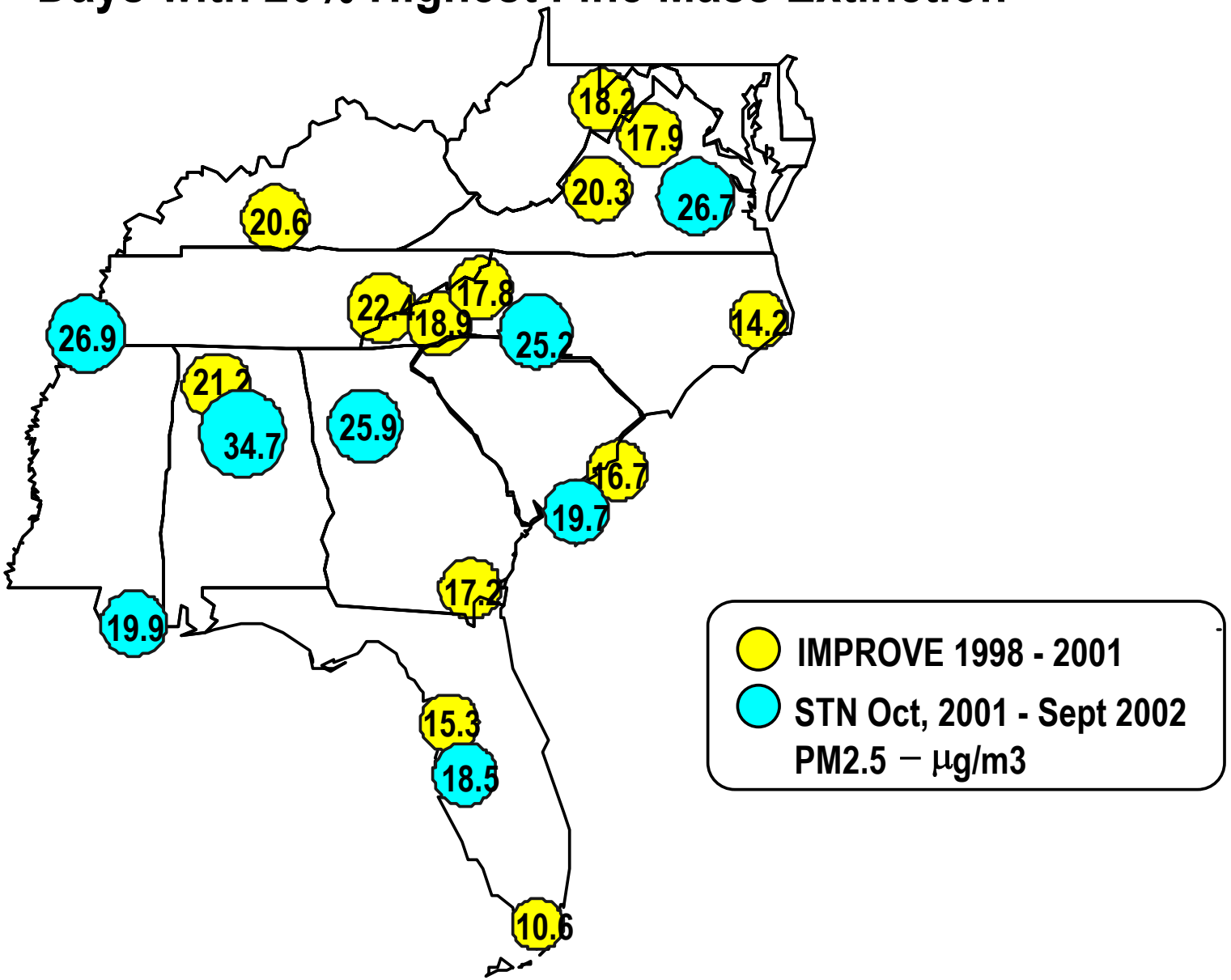
Fine Mass on 20% Best Visibility Days - SEARCH 1999 - 2001



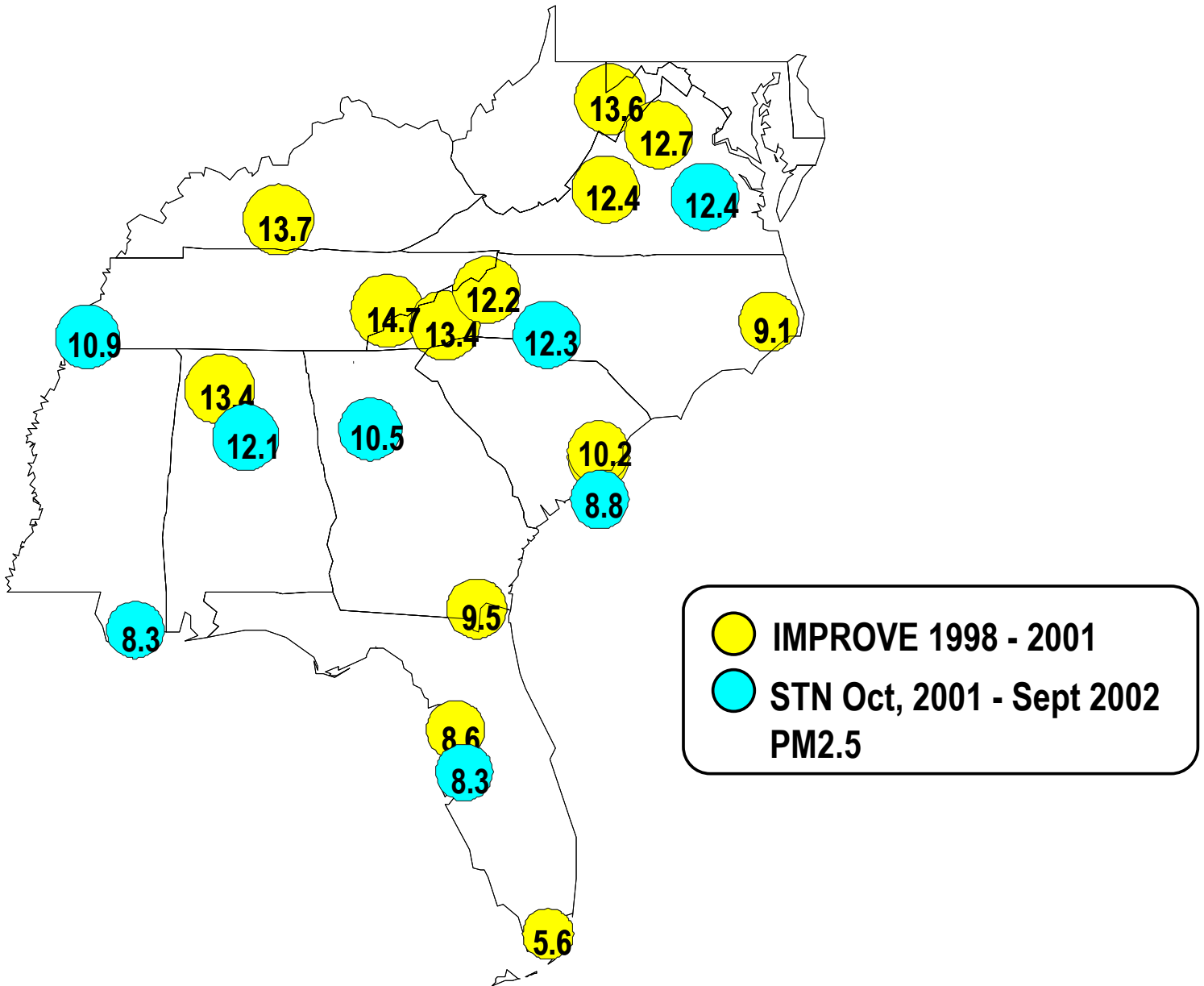
Speciation Trends Network (STN) Sites in VISTAS region



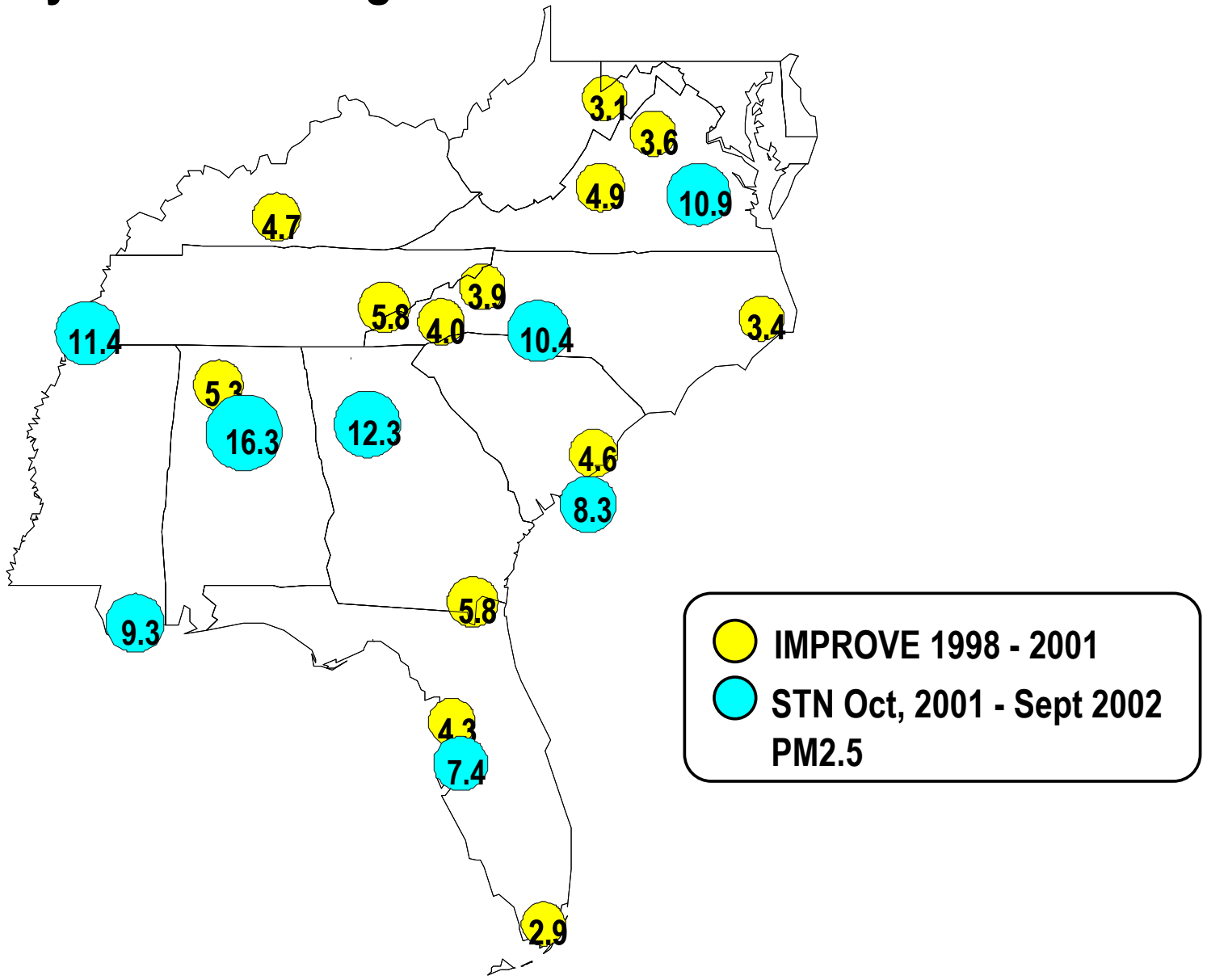
Reconstructed Fine Mass (μg/m^3) - Days with 20% Highest Fine Mass Extinction



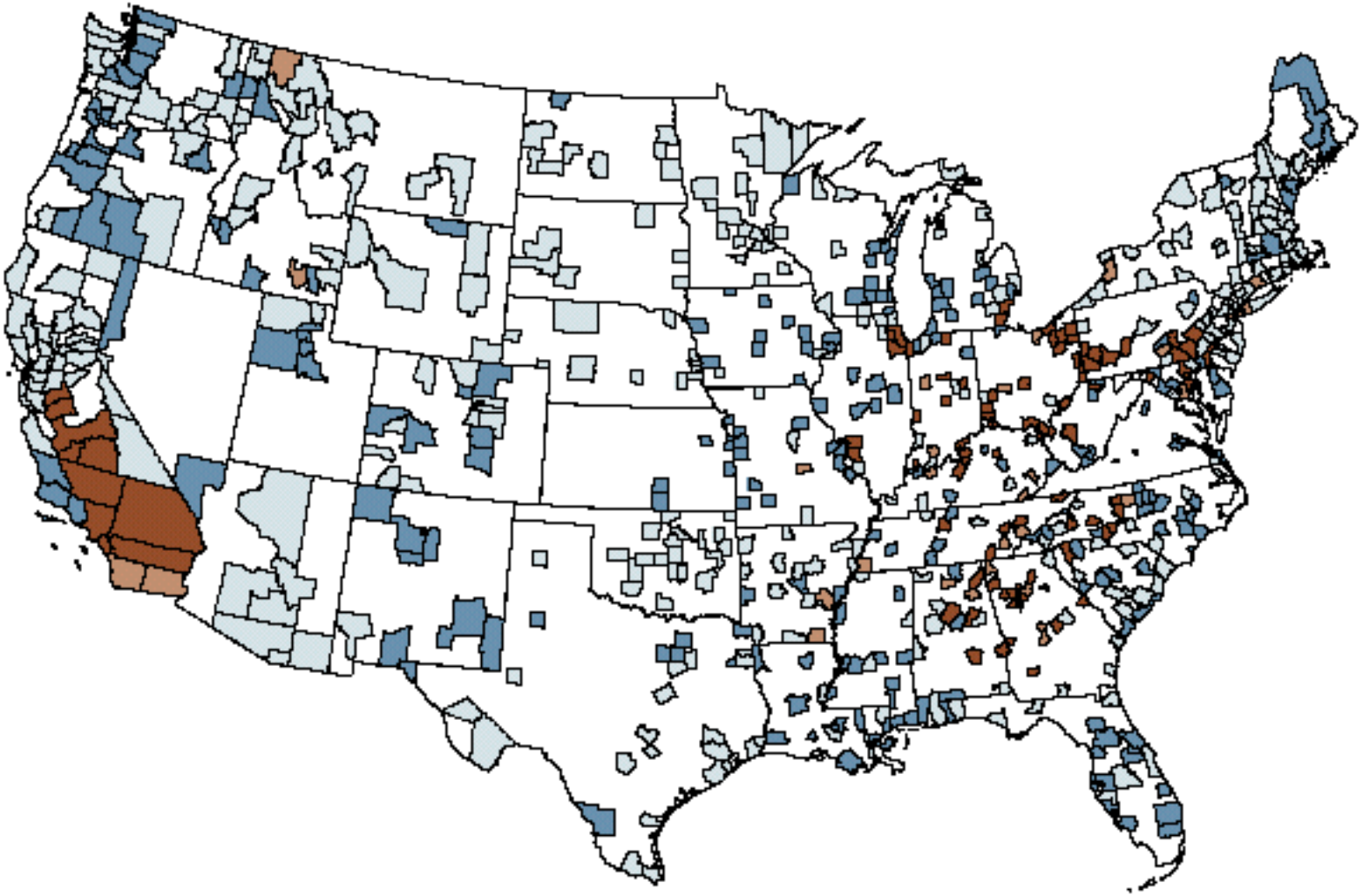
Ammonium Sulfate Mass
Days with 20% Highest Fine Mass Extinction



Organic Carbon Fine Mass
Days with 20% Highest Fine Mass Extinction

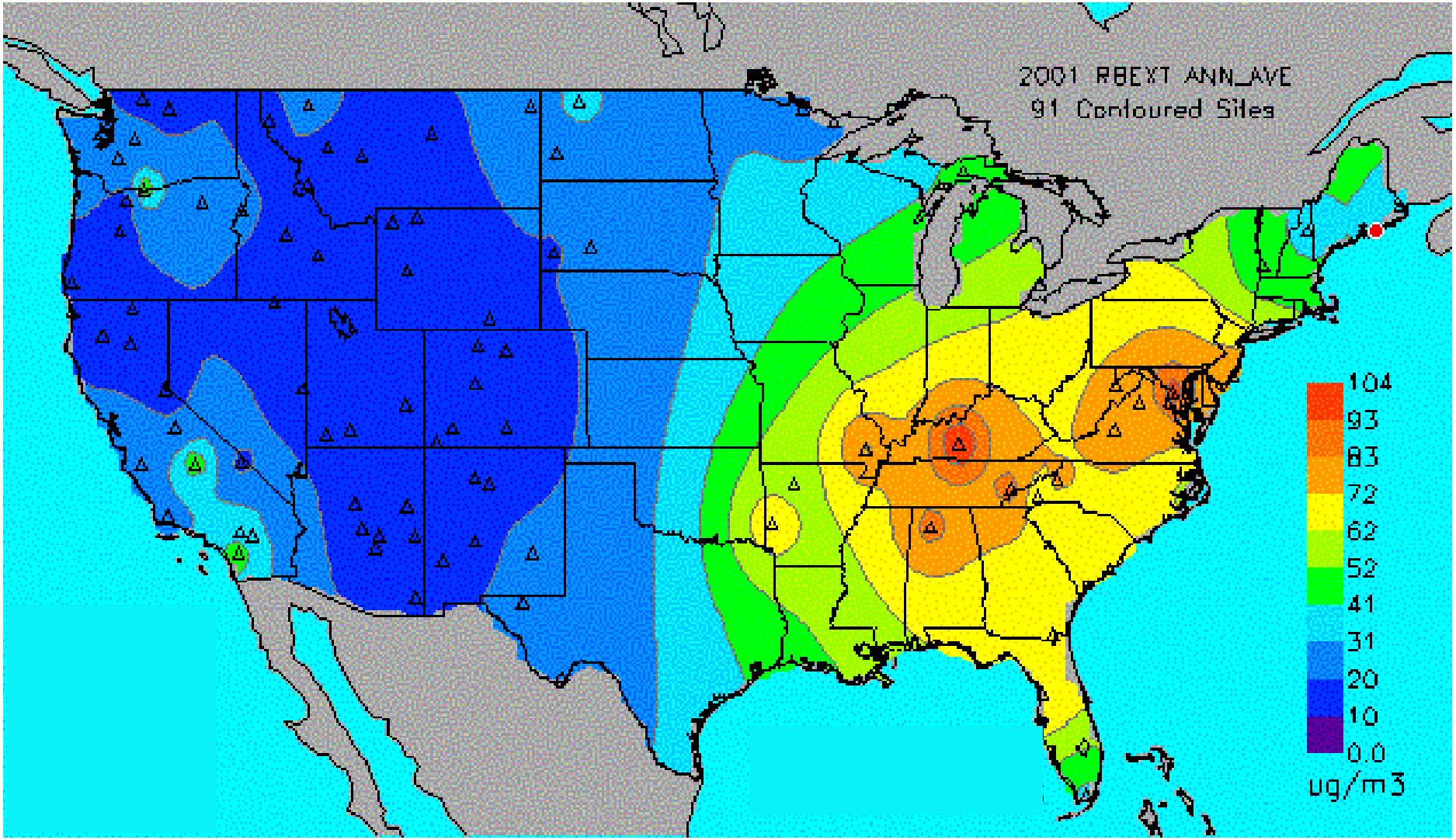


Counties not meeting PM2.5 annual standard based on 2000-2002 data



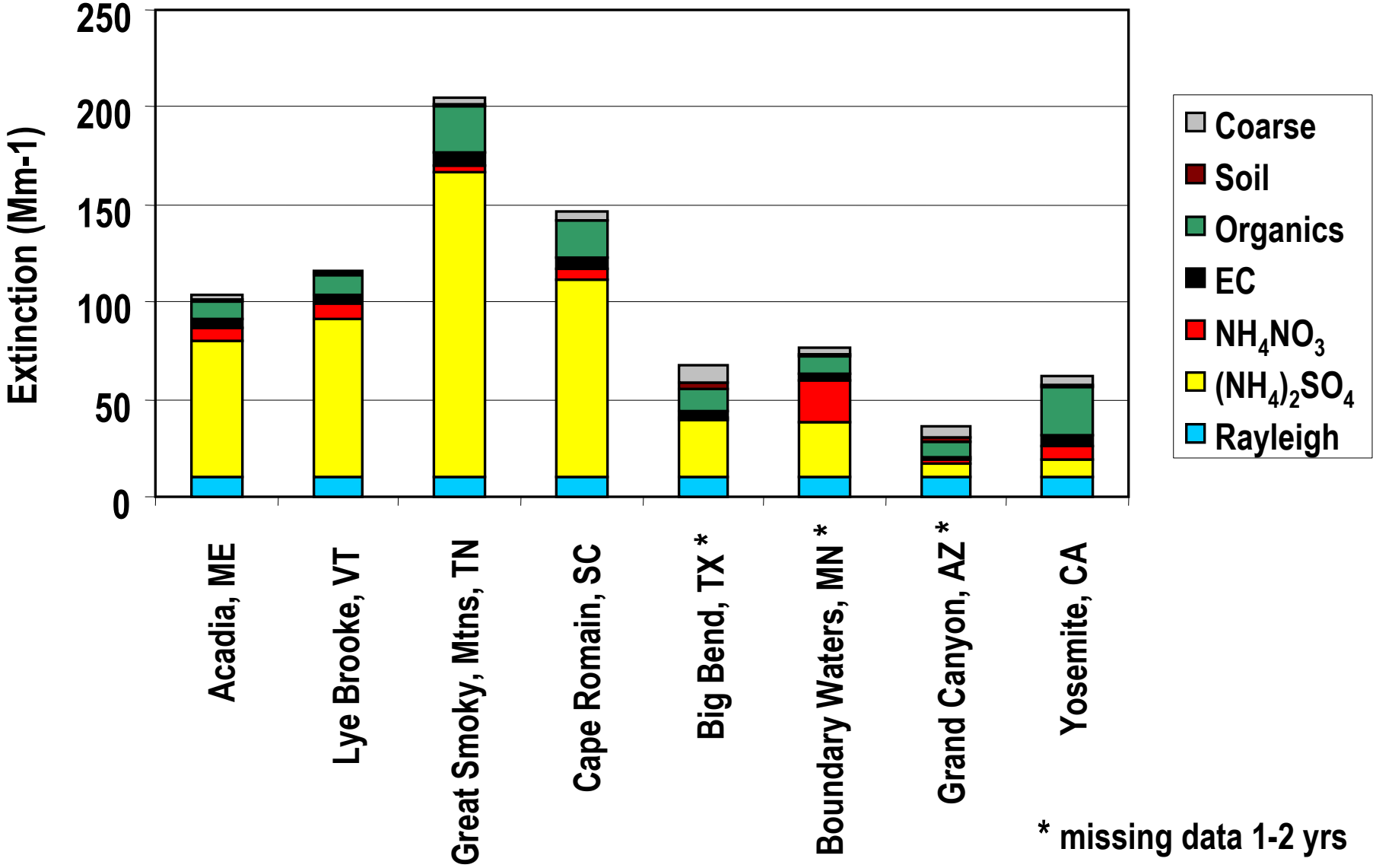
From EPA assessment group

2001 Annual Average Light Extinction



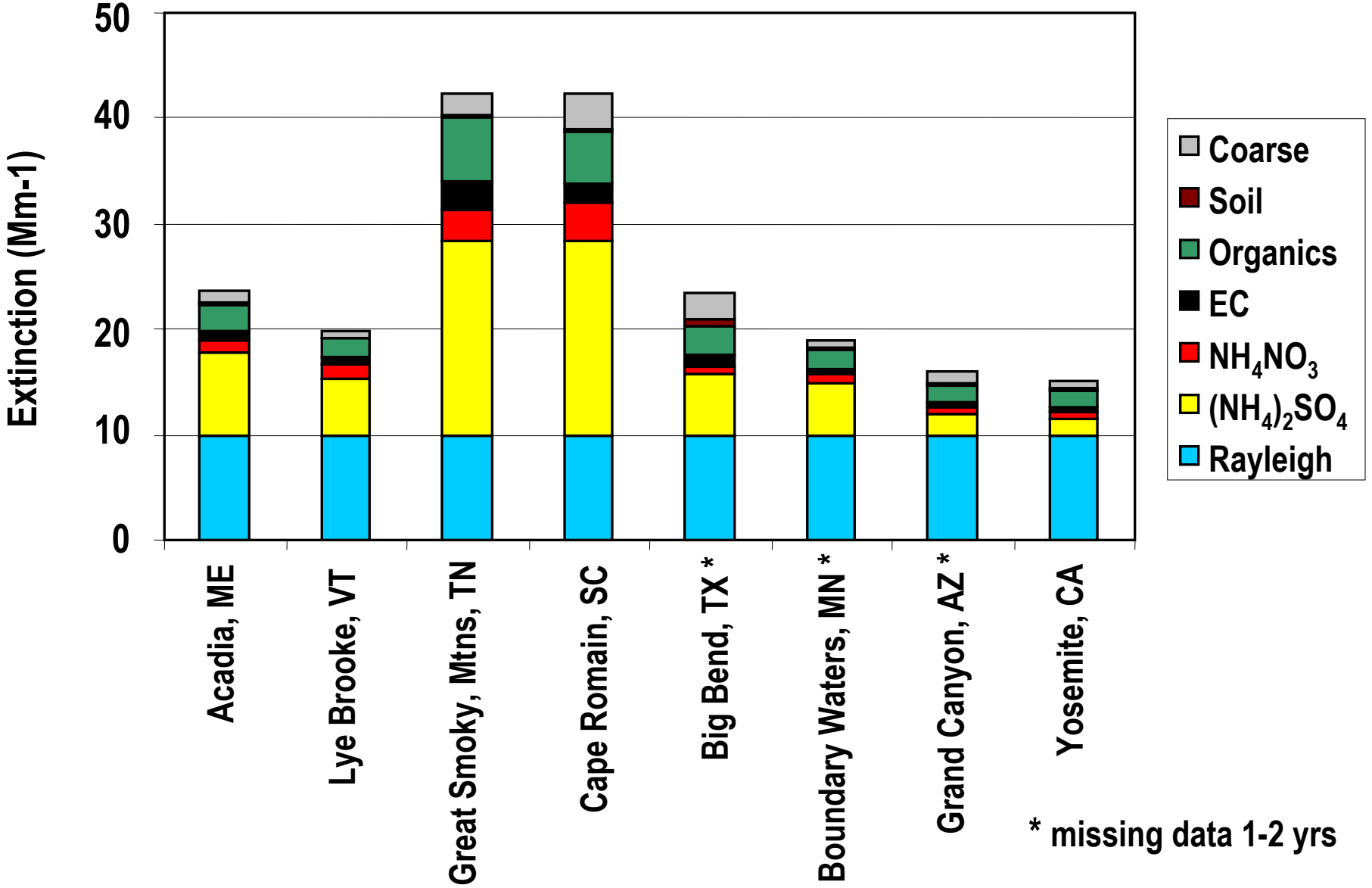
From VIEWS website

Light extinction on 20% Haziest Days - IMPROVE (1998-2001)

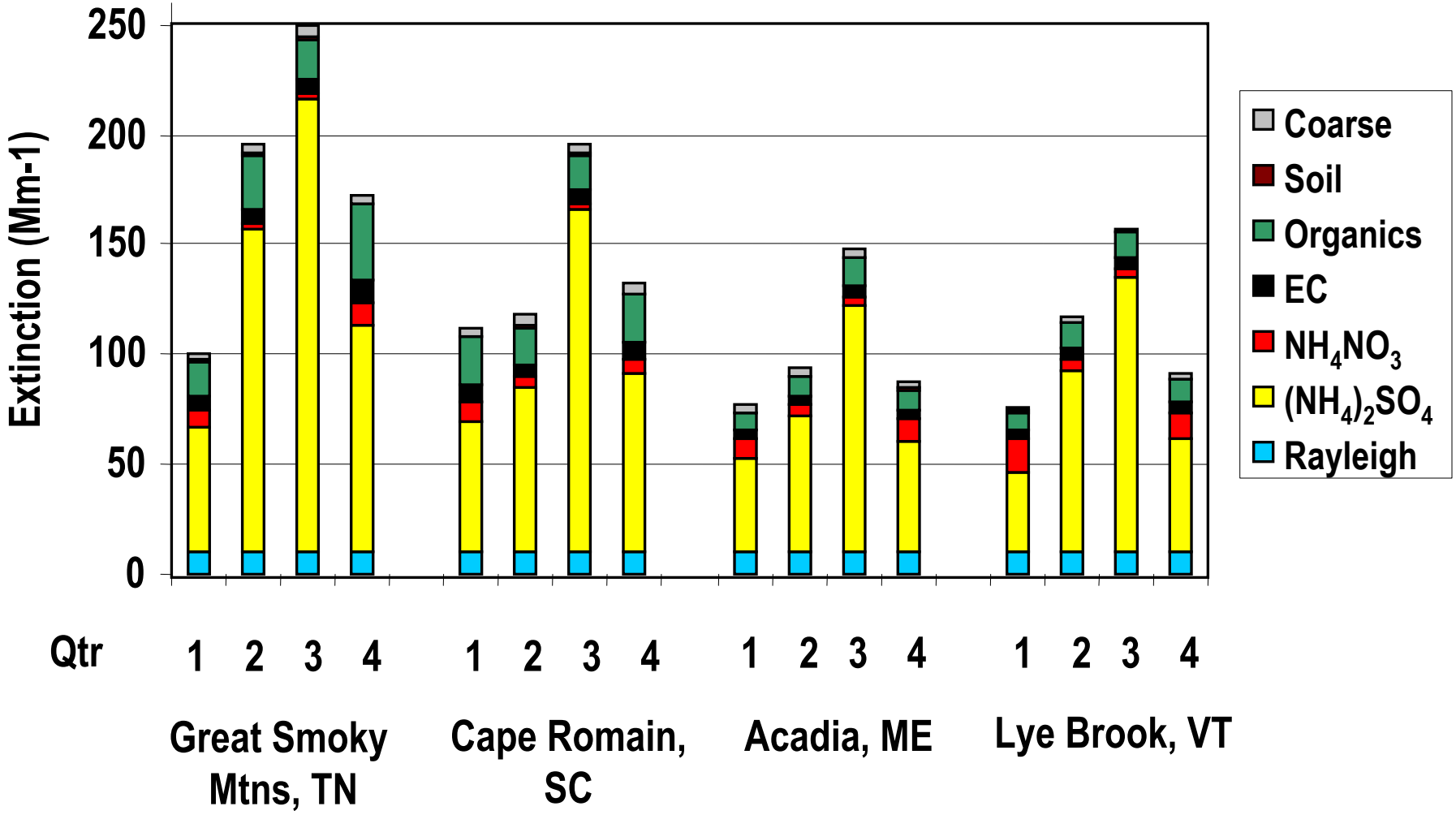


* missing data 1-2 yrs

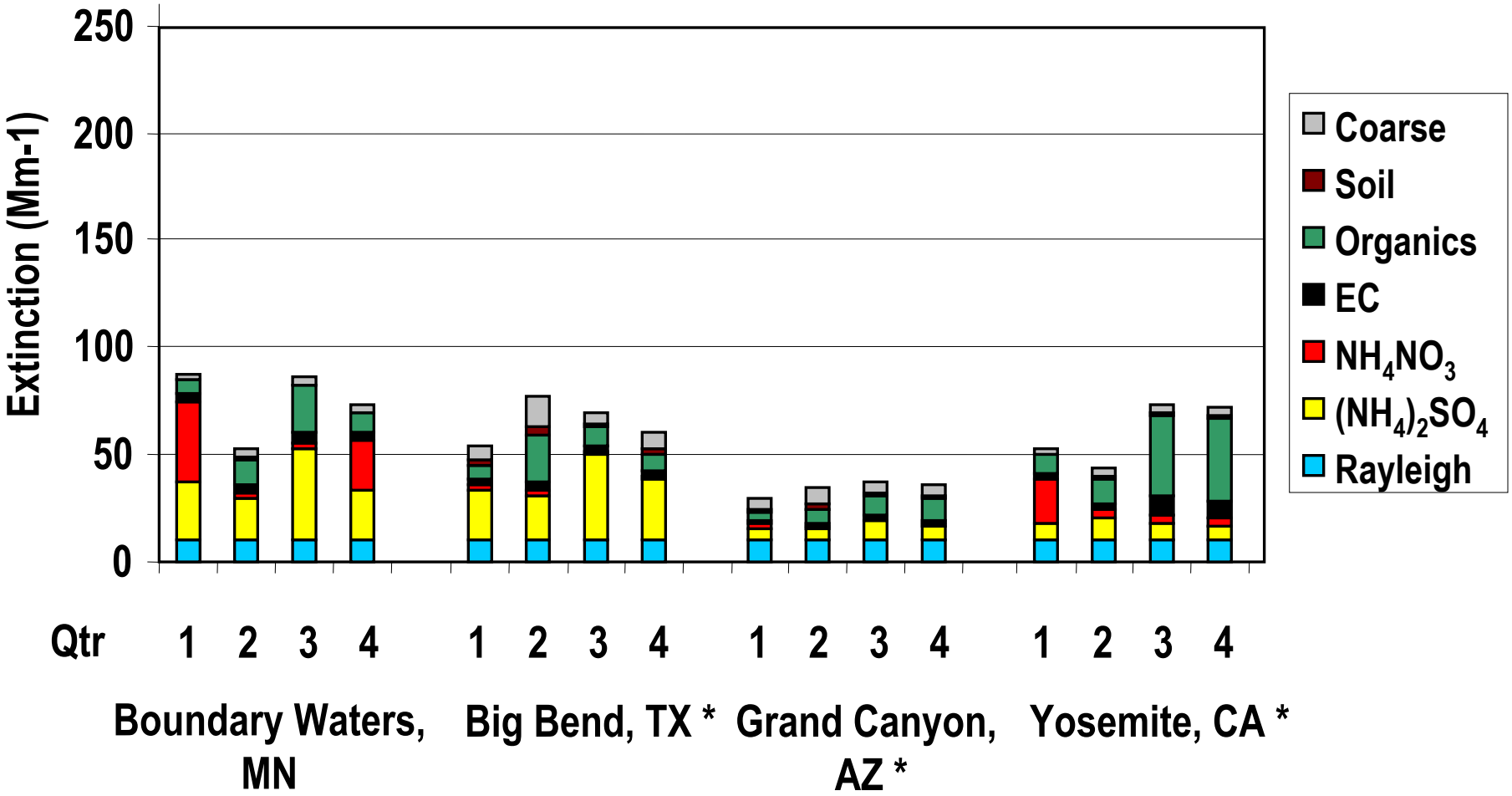
Light extinction on 20% Clearest Days - IMPROVE (1998-2001)



Light extinction on 20% Haziest Days per Quarter - IMPROVE (1998-2001)



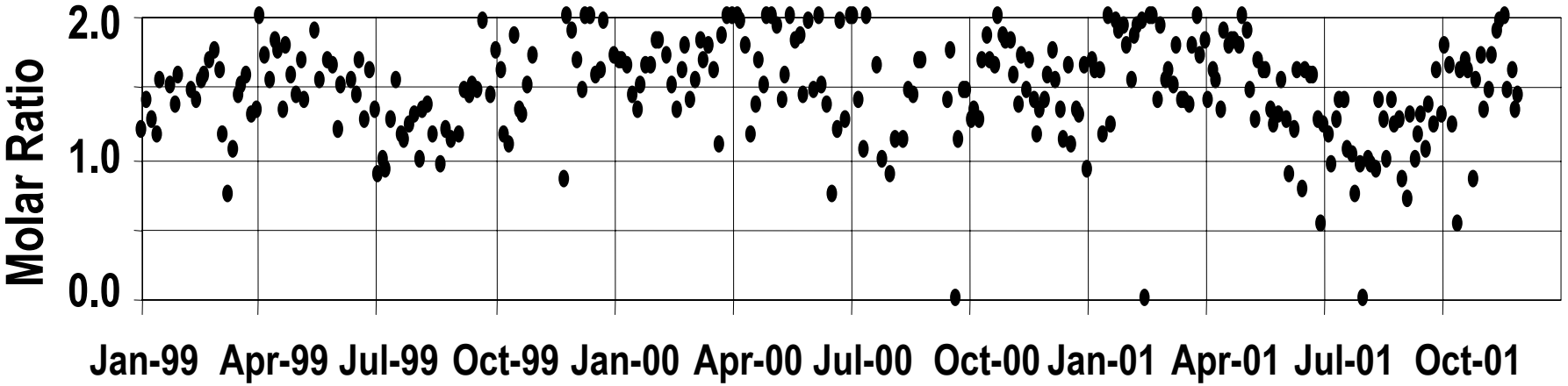
Light extinction on 20% Haziest Days per Quarter - IMPROVE (1998-2001)



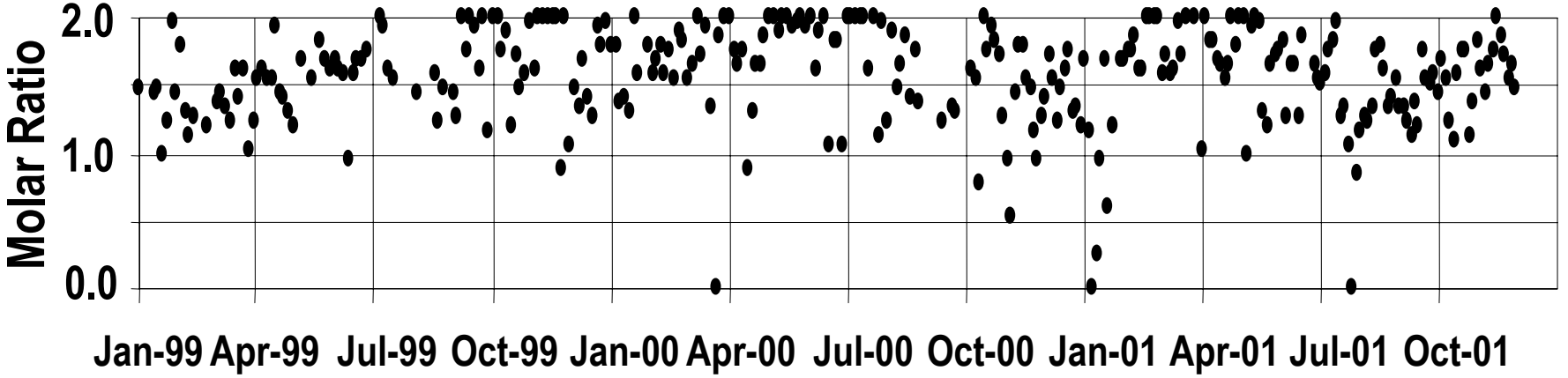
* missing data 1-2 yrs

Molar Ratio NH4:SO4 at IMPROVE Sites

Great Smoky Mtns, TN

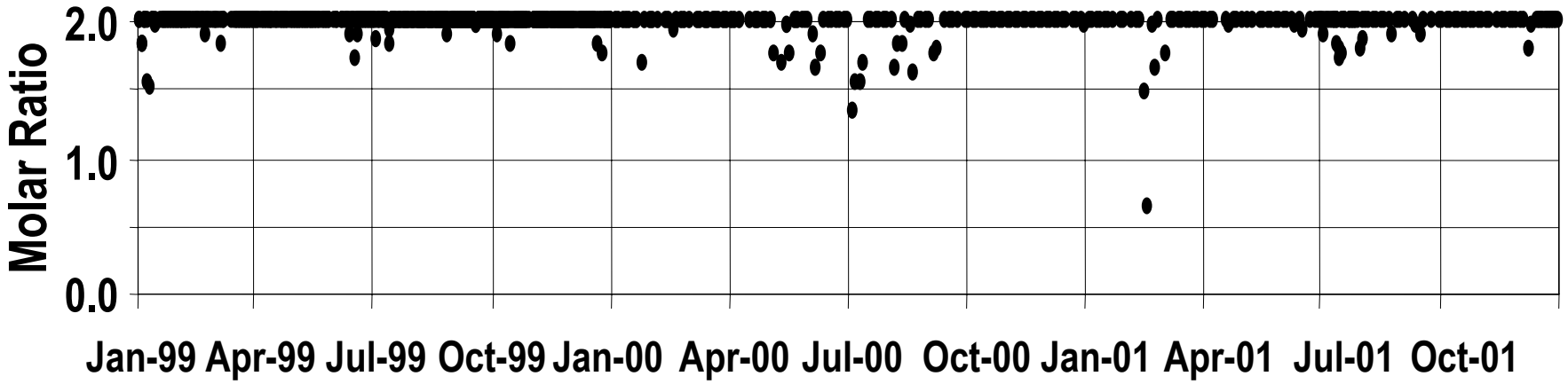


Shenandoah, VA

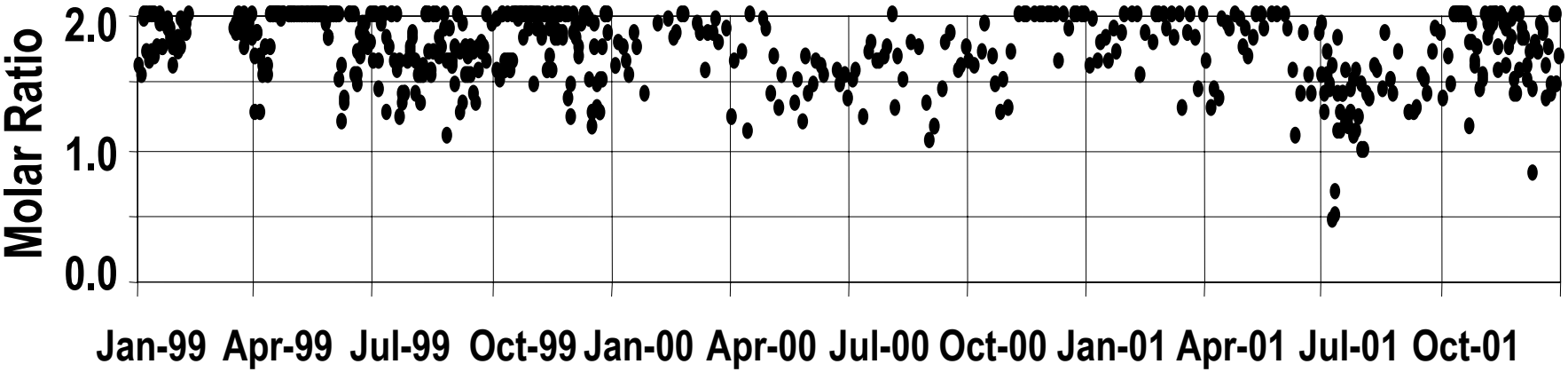


Molar Ratio NH4:SO4 at IMPROVE Sites

Birmingham, AL

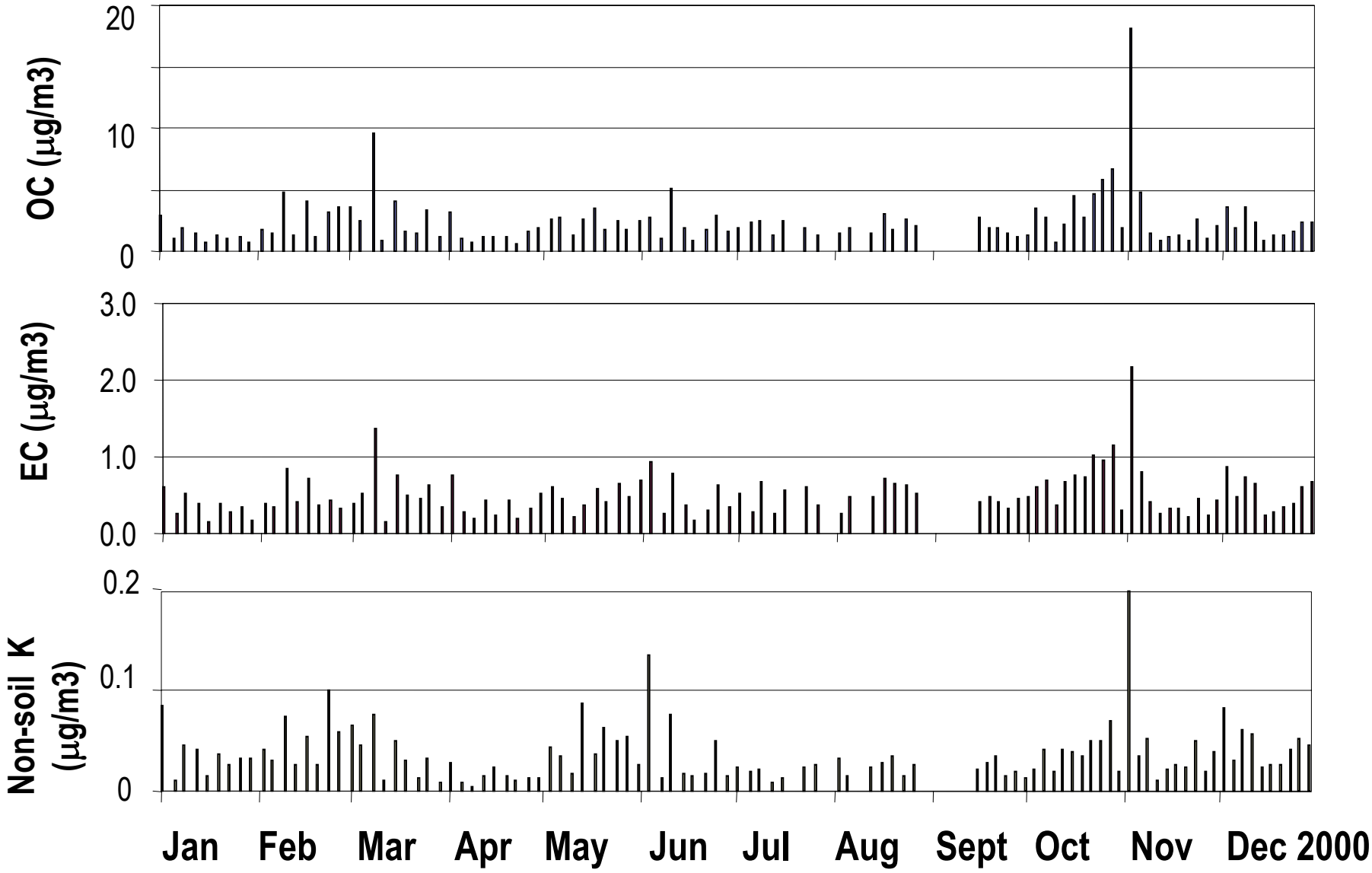


Centerville, AL



These data suggest local urban sources of NH3 emissions.

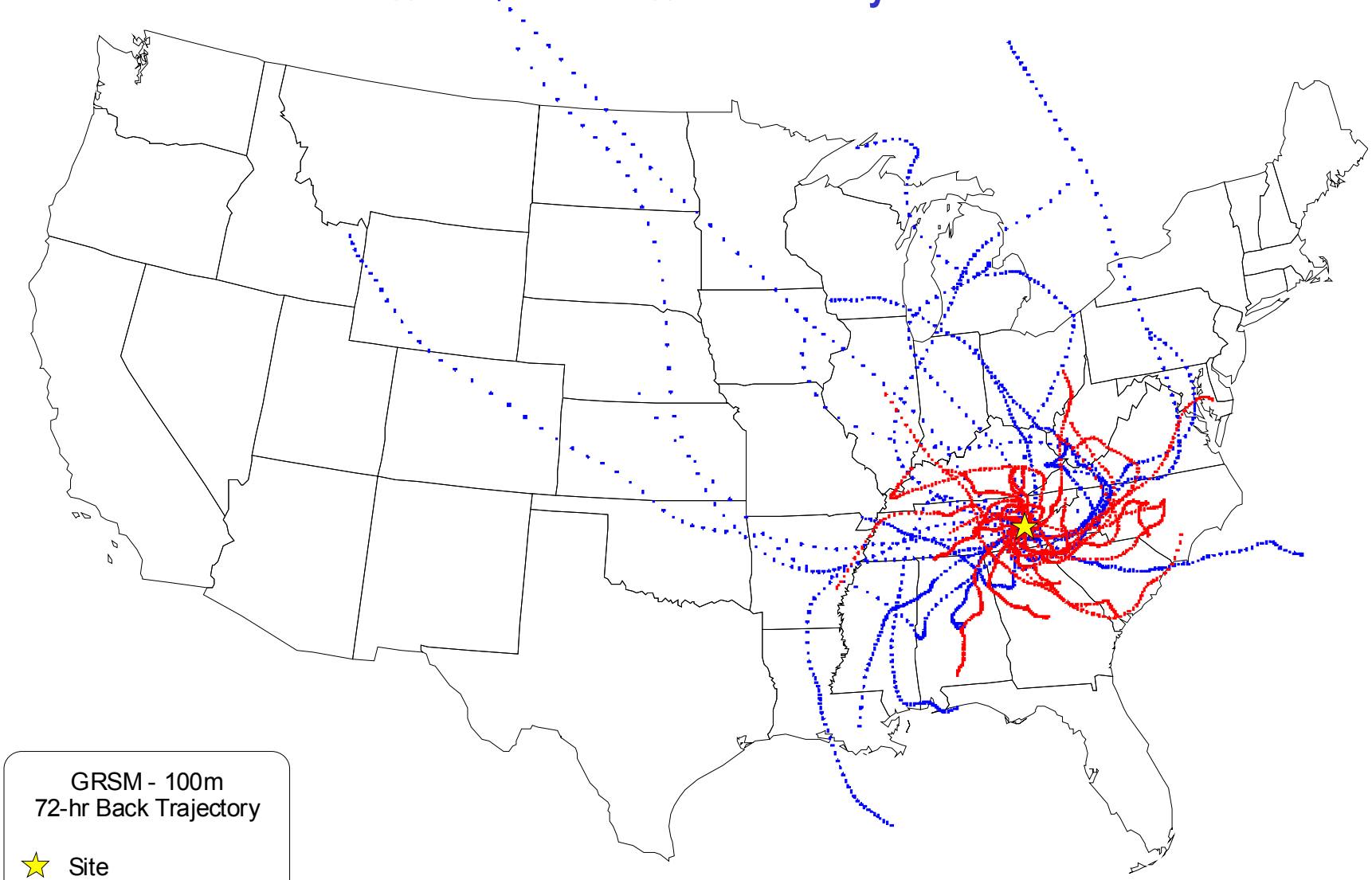
Organic Carbon, Elemental Carbon, non-soil Potassium as Fire Indicators
2002 IMPROVE data - Great Smoky Mtns.



VISTAS Data Analysis Next Steps

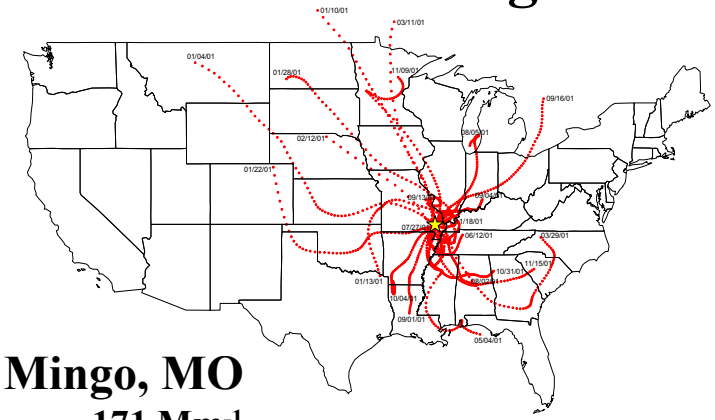
- Back Trajectory Analyses
  - contrast source areas on high and low visibility days
  - track source areas of specific components:
    - sulfate
    - fire
    - Saharan dust (not frequent in Southeast except summer 1998)
  - evaluate contributions from VISTAS states to Class I areas in other regions

72-hr Back Trajectories for Great Smoky Mountains National Park for 5% haziest and 5% clearest days in 1998-2001



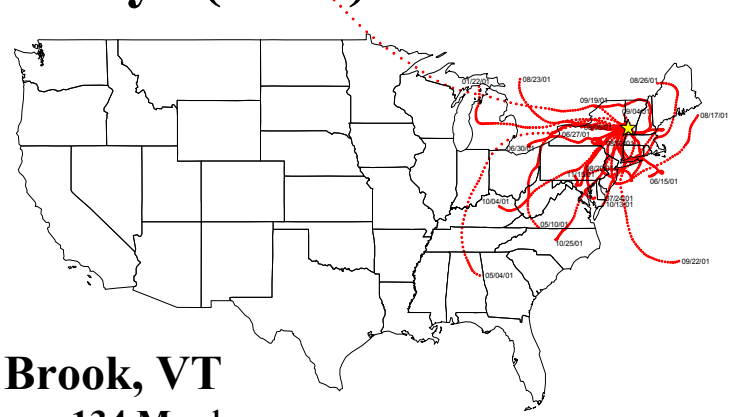
Back Trajectories for Nearby IMPROVE Sites

20% Highest Extinction Days (2001)



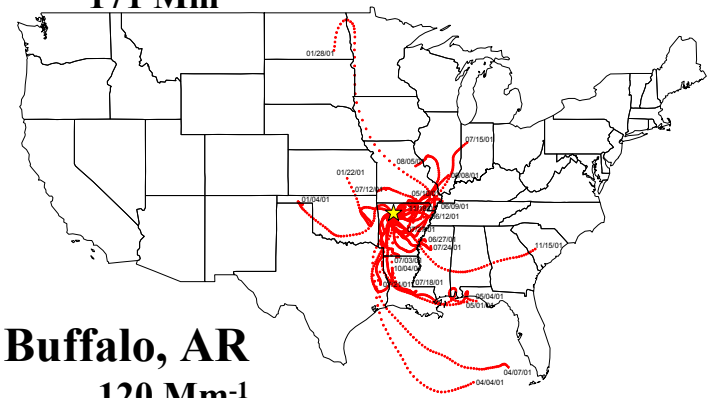
Mingo, MO

171 Mm^{-1}



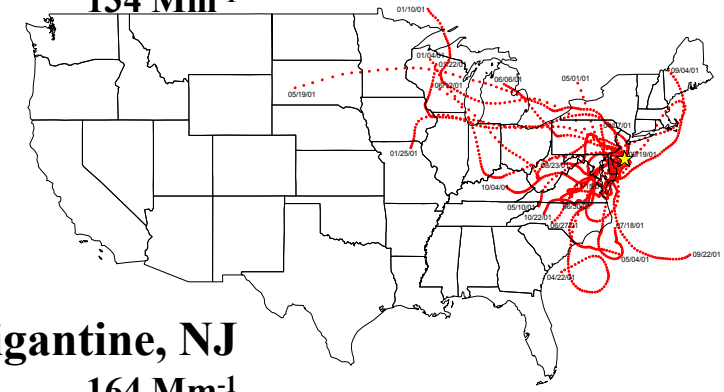
Lye Brook, VT

134 Mm^{-1}



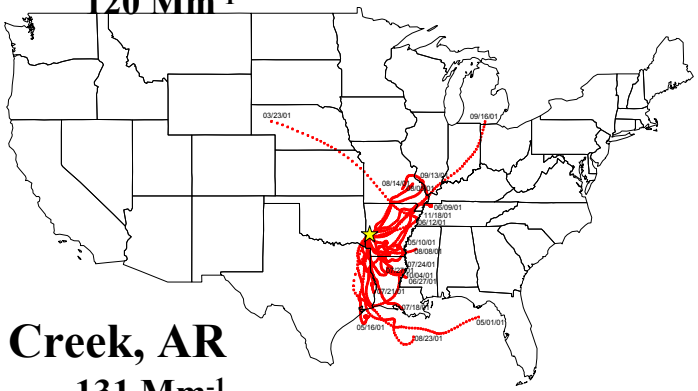
Upper Buffalo, AR

120 Mm^{-1}



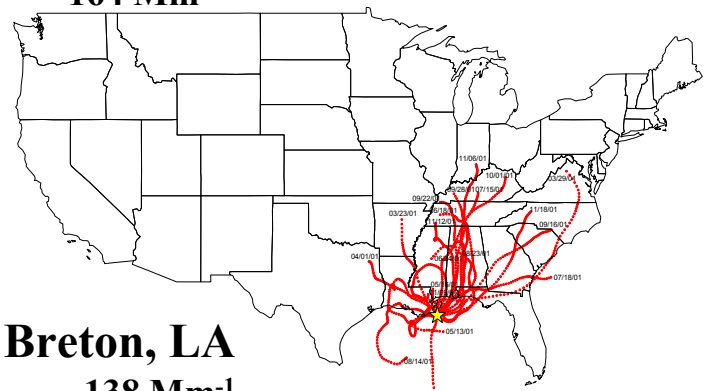
Brigantine, NJ

164 Mm^{-1}



Caney Creek, AR

131 Mm^{-1}



Breton, LA

138 Mm^{-1}

VISTAS Focus Sites

rural urban

Continuous, daily, every 3rd day

VISTAS Focus Sites

- Objective: data with high temporal resolution for model performance evaluation
- Contractors:
  - ARA (Eric Edgerton): Millbrook, NC
  - TVA: Look Rock, TN
  - SC in-kind service: Cape Romain, SC
- Data collected 12-24 months minimum

VISTAS Focus Sites

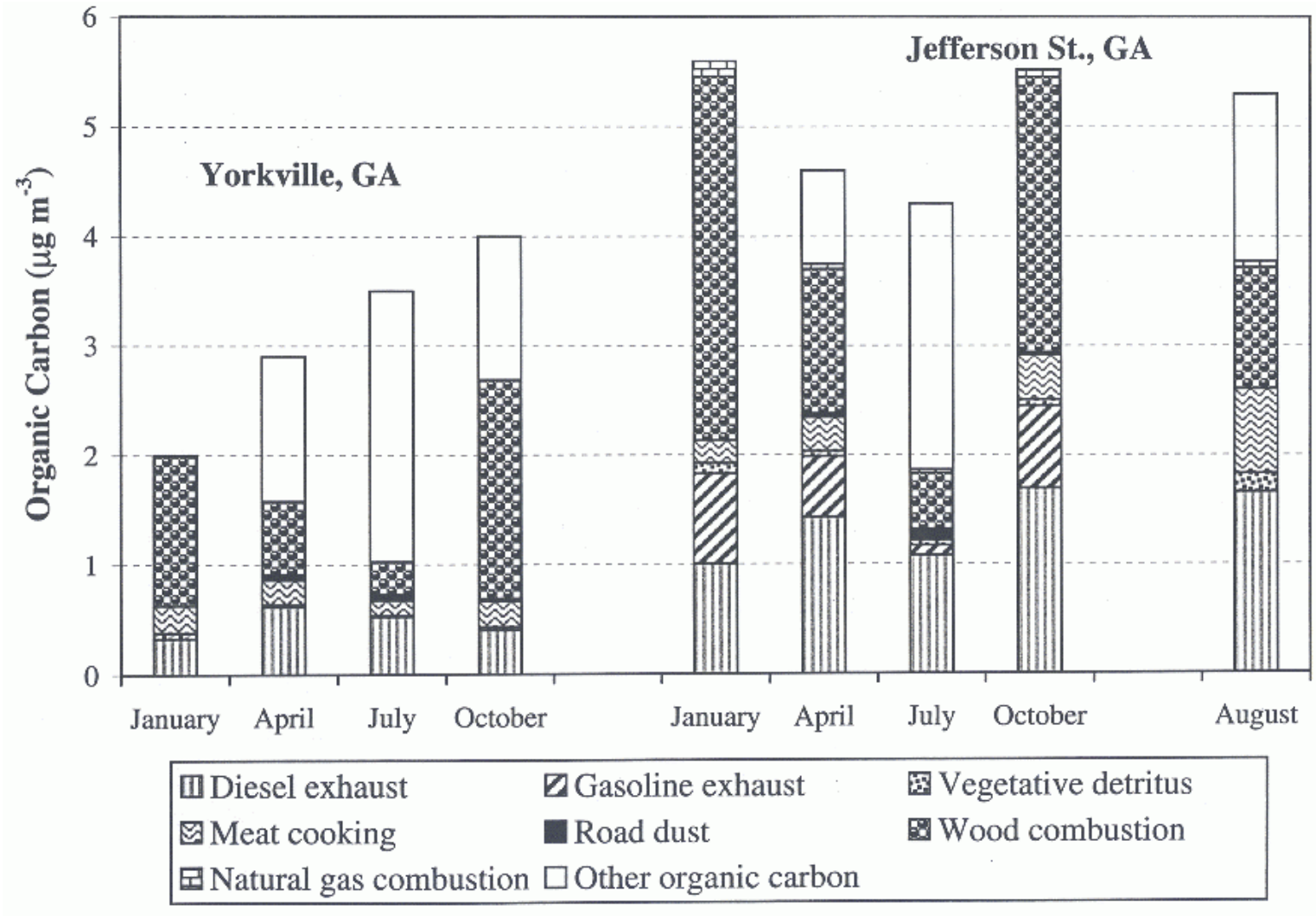
- Surface meteorology
- Speciated $PM_{2.5}$ (every 3rd day)
- Continuous $PM_{2.5}$ mass (TEOM)
- Continuous $PM_{2.5}$ speciation
  - R&P SO_4, NO_3, Carbon; Aethalometer
  - Harvard SO_4 at Millbrook, Look Rock
  - NO_3 and NH_4 at Millbrook
- Gases: SO_2, NO_y, CO, O_3
- Nephelometers: Cape Romain, Look Rock

VISTAS Focus Sites

- Status
  - Training and installation of equipment complete (some exceptions at Millbrook)
  - Equipment shakedown underway (problems with R&P NO3 and Carbon monitors)
  - Developing Quality Assurance Plans, Standard Operating Procedures

Sources of Fine Particle Organic Carbon

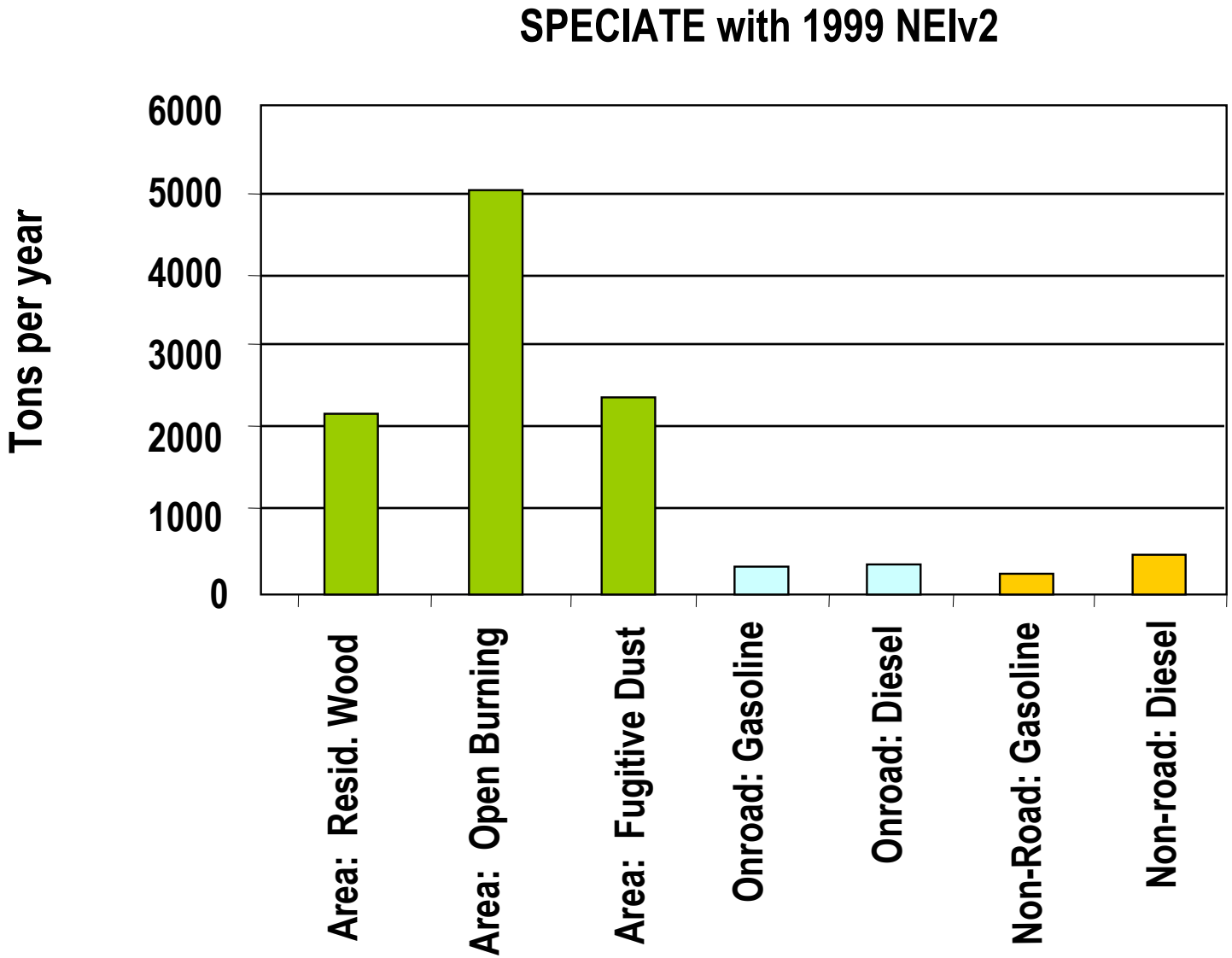
Chemical Mass Balance Analyses at SEARCH sites



SEARCH

Zheng, Cass, Schauer, Edgerton, 2002, Environmental Science & Technology

Annual Primary PM2.5: Organic Carbon - Atlanta*, GA



*6 counties: Fulton, Cobb, DeKalb, Gwinett, Cherokee, Forsyth

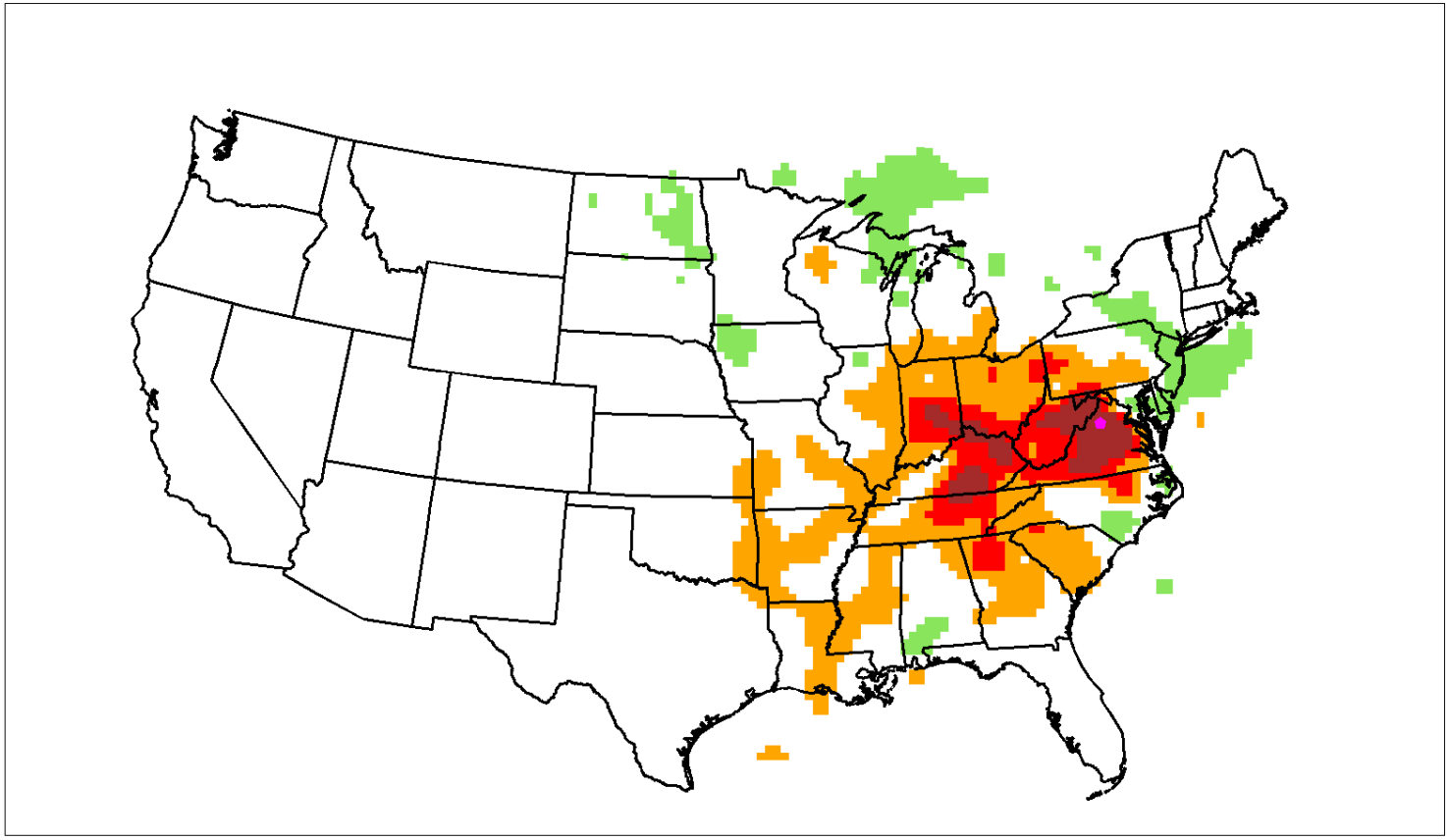
VISTAS Data Analysis Next Steps

- Source Apportionment Techniques
  - source factors (e.g. study by Batelle funded by MARAMA + Midwest RPO, also studies by EPA, VT, others)
  - CATT tool

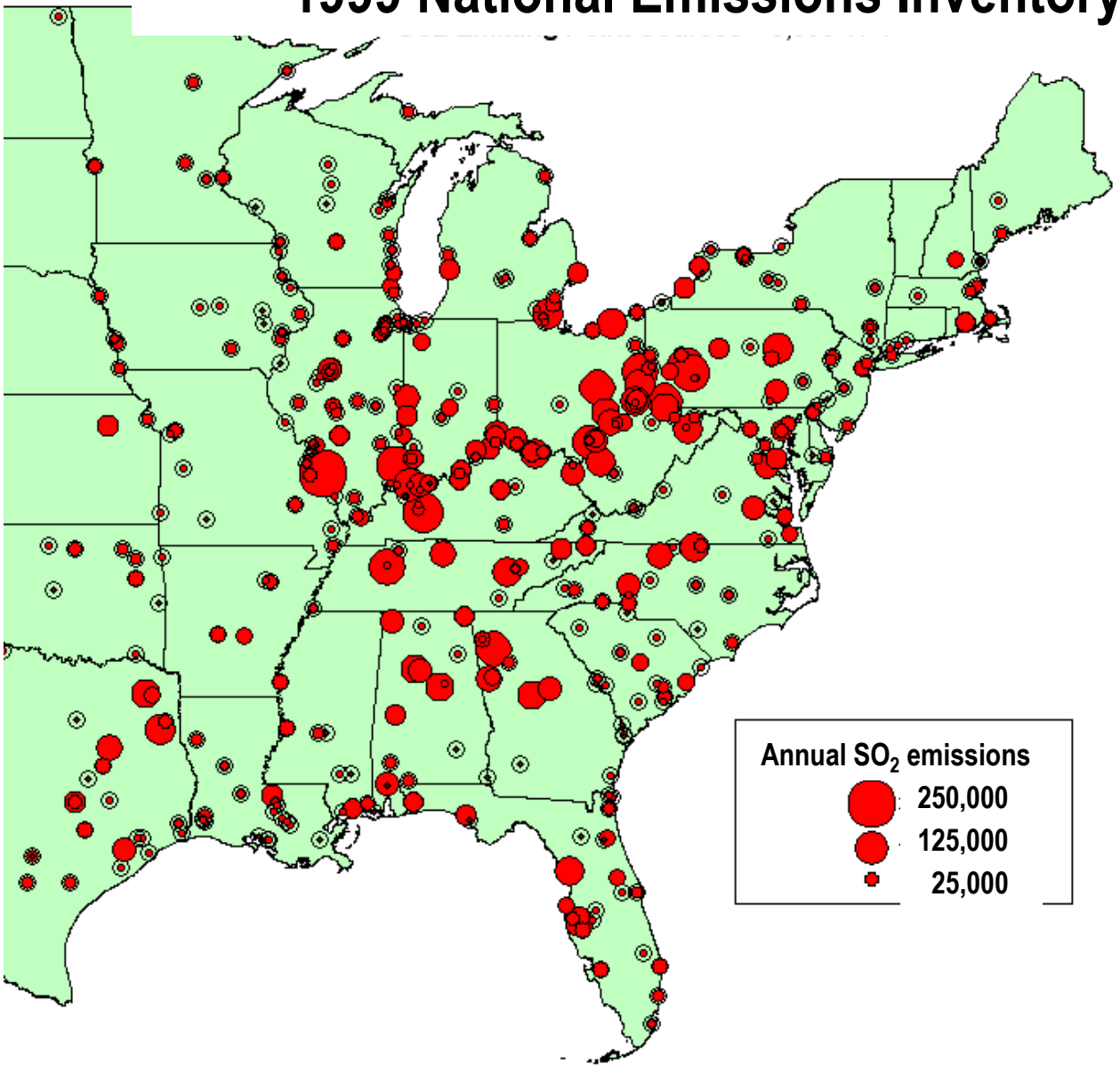
Probable Source Areas for Secondary Sulfate

(work by Batelle for Midwest RPO)

Site: Shenandoah National Park Source: 4



SO2 Emitting Point Sources >5,000 Tons per year
1999 National Emissions Inventory v 2



VISTAS Data Analysis Next Steps

- Characterize meteorology and relationship to $PM_{2.5}$ and visibility at IMPROVE sites in Southeast
  - VISTAS to post in June 03 request for proposals for CART analyses
  - MARAMA has similar project under way for urban areas and $PM_{2.5}$ forecasting

VISTAS Projects

- Data Analysis – Phase I completed
- Emissions Inventories – 1st reports due this fall
- Meteorological Modeling – Underway
- Emissions and Air Quality Modeling – Underway
- Control Strategy Options – Under consideration
- Due Date for Delivery – December 2005

VISTAS Data Analysis Next Steps

- Additional monitoring?
  - currently more ideas than funding
- Opportunities for collaboration with MANE-VU?


VISTAS Web Site: www.vistas-sesarm.org