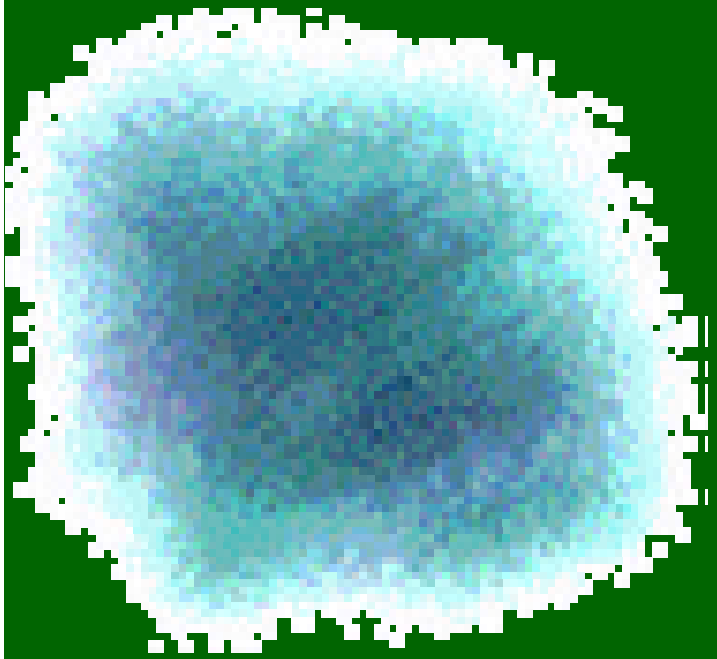
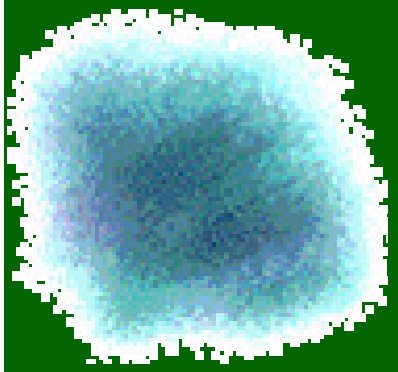
PM2.5 Speciation



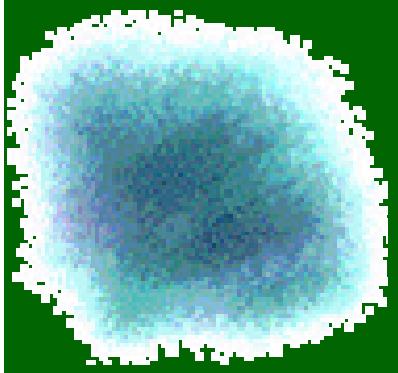
What We Got so Far…
What Are We Getting?
What We're Going to Get

Session Topics



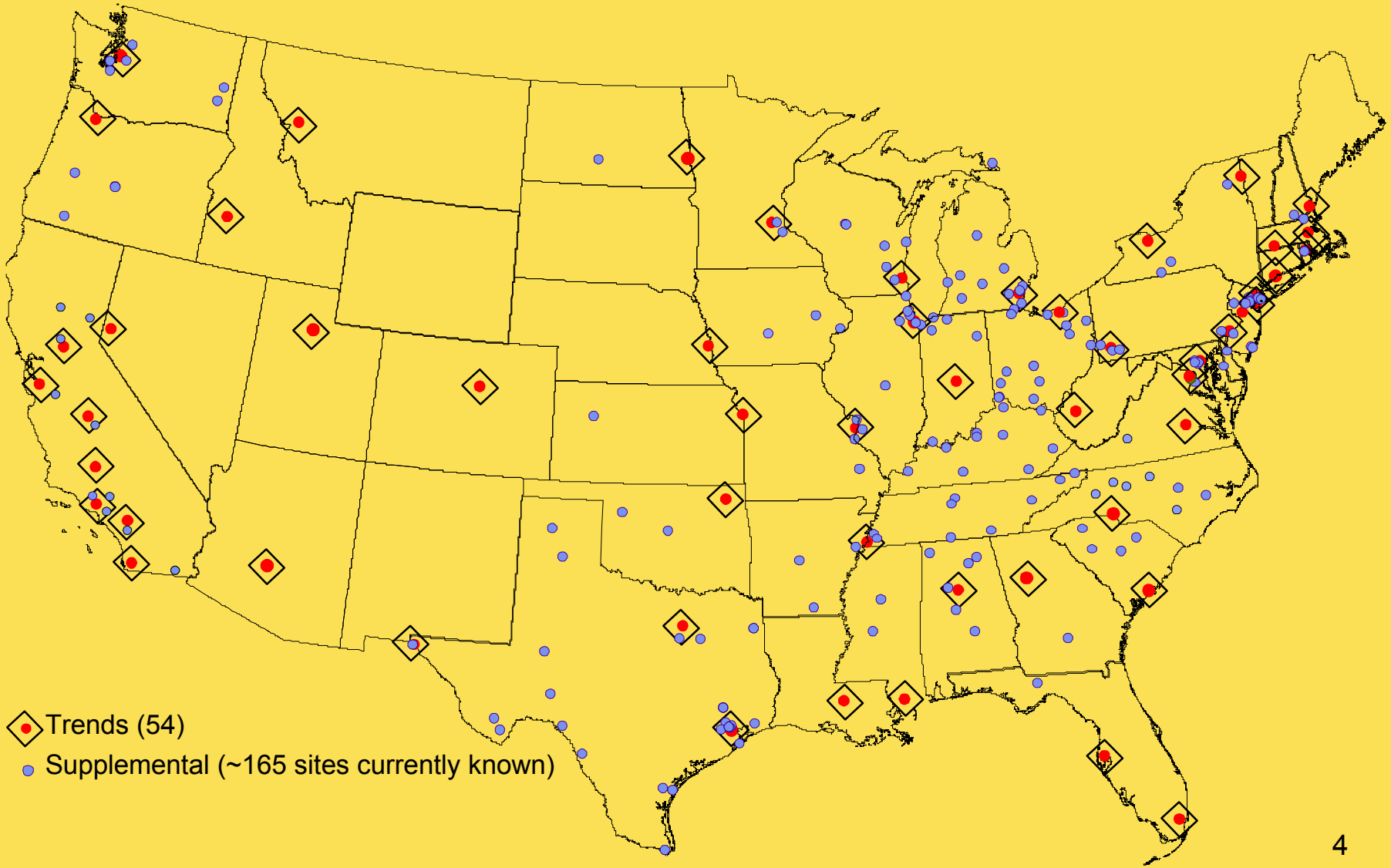
- Current Networks
- What is the data saying
- STN-IMPROVE Intercomparison
- Future plans

Current Networks

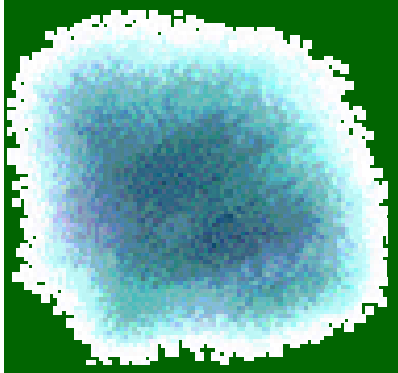


- Trends/SLAMS Network
- IMPROVE/ IMPROVE Protocol Network
- Continuous Speciation Sites

Current TRENDS/SLAMS $PM_{2.5}$ Speciation Networks

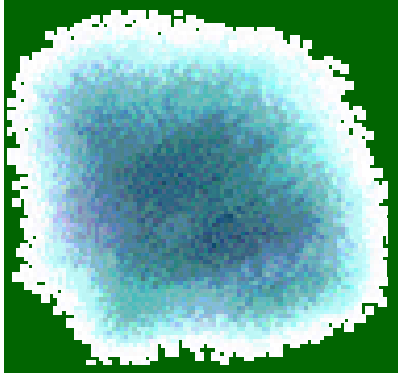


Current Speciation Trends/SLAMS Network



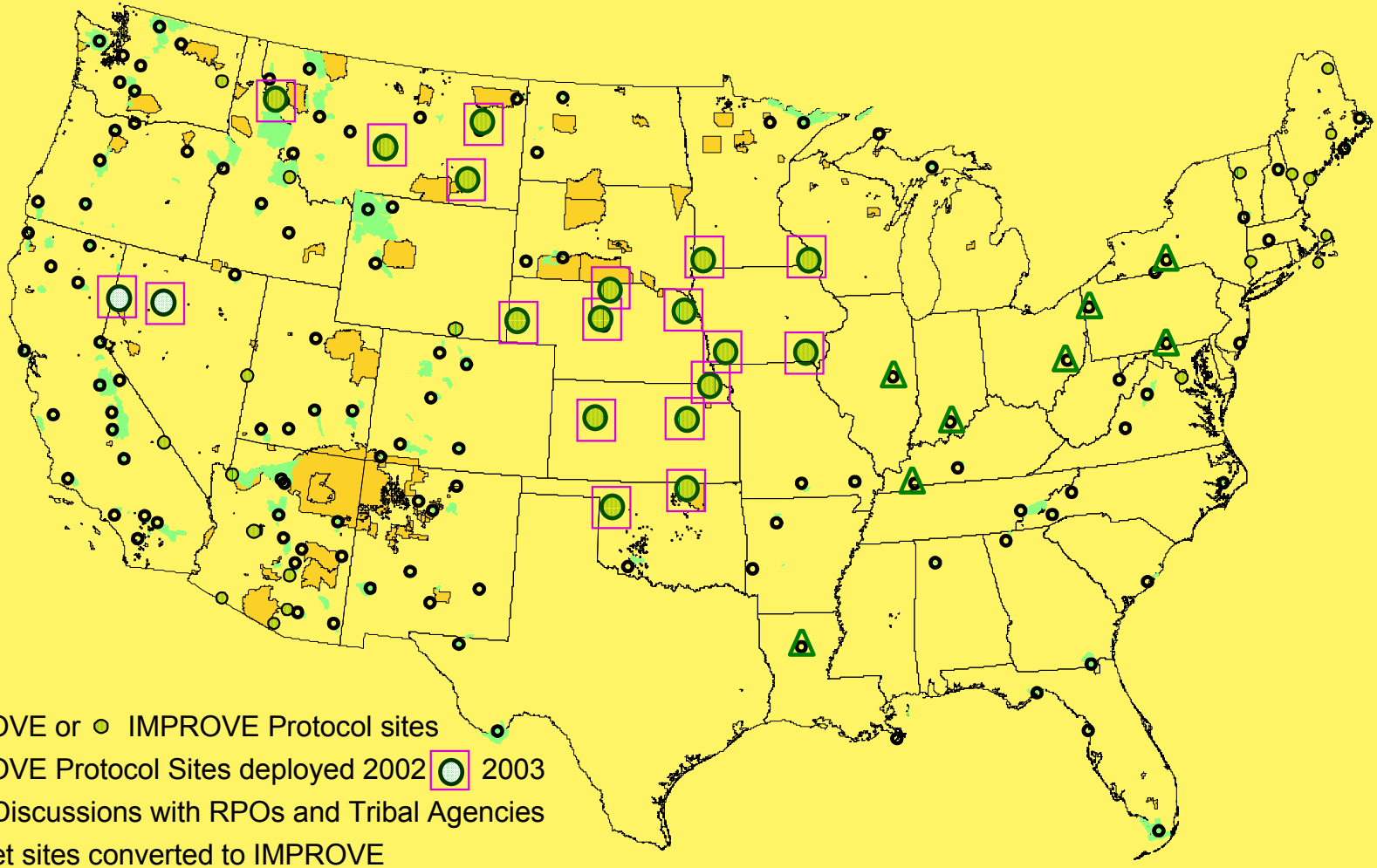
- ~220 sites reporting to AQS
- Samplers: 8 URG MASS; 27 Andersen RASS; 34 R & P's; 159 Met One SASS
- Frequencies: 1 - 3 day– 80; 1 - 6 day-- 138

IMPROVE/IMPROVE Protocol Network



- 119 Sites at Class I Areas run by FLM
- 8 converted CASTNET Sites
- ~8 RPO or State Consortia Sites
- 11 Tribal sites
- 16 State
- 3 EPA/State/FLM Sites

Current IMPROVE, IMPROVE Protocol Sites



IMPROVE or IMPROVE Protocol sites

IMPROVE Protocol Sites deployed 2002 2003

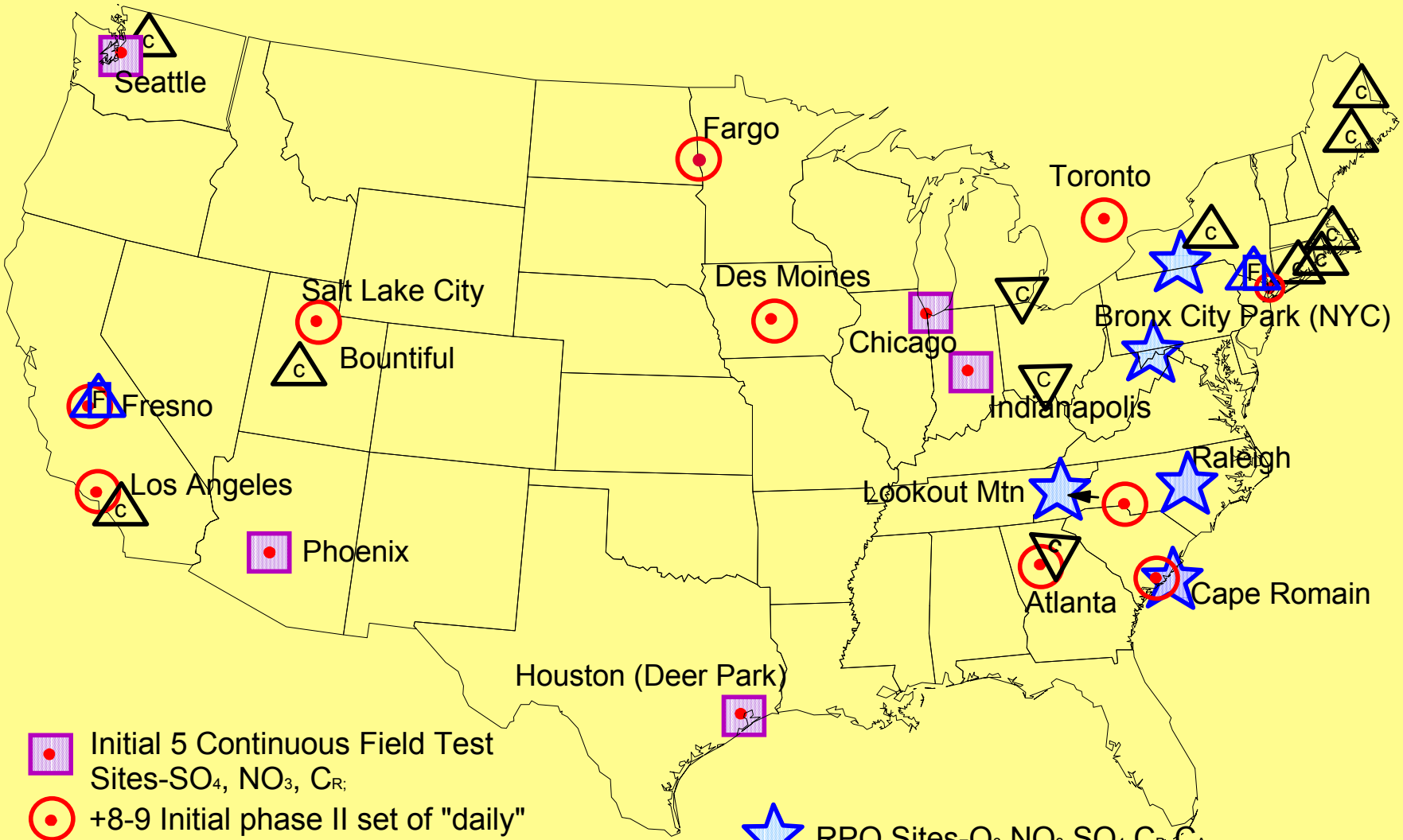
From Discussions with RPOs and Tribal Agencies

Castnet sites converted to IMPROVE

Class I Areas

Tribal Lands

Continuous Speciation Sites with PM 2.5 Speciation and FRM Sites



Initial 5 Continuous Field Test Sites-SO_4, NO_3, C_R;

+8-9 Initial phase II set of "daily" planned sites

State/Local/Tribal Current ; Planned

RPO Sites-O_3, NO_3, SO_4, C_B, C_A, C_N, C_S; Currently operating

PM2.5 Speciation Summary based on EPA's Speciation Network

EMAD/AQTAG

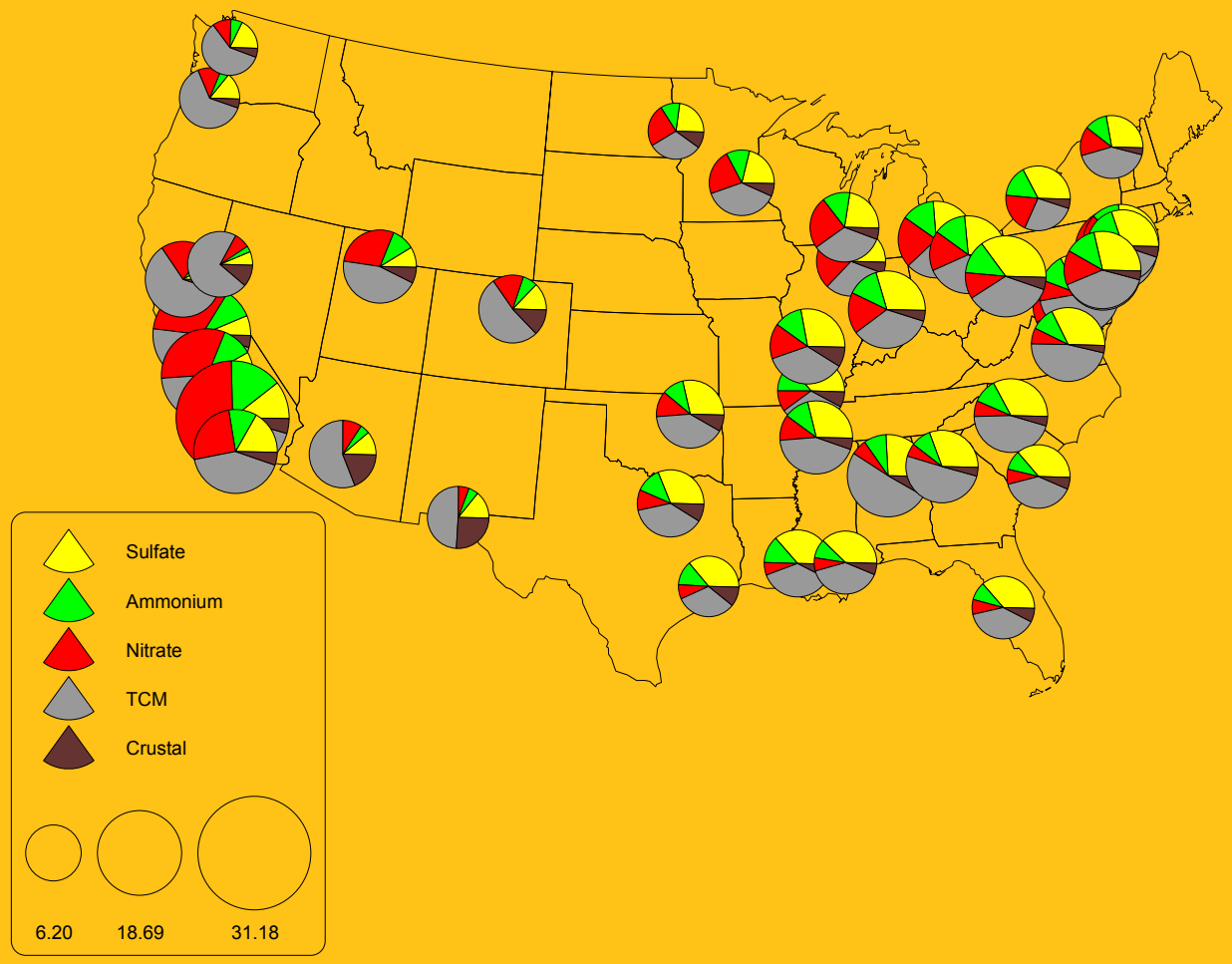
September 5, 2003

Talking points about next slide

- Shows annual average PM2.5 chemical concentrations for September 2001-August 2002 for those sites that had complete data for this time period.
- All components reported as measured. Total Carbonaceous Mass (TCM) is [OCM+EC], where OC has been blank-corrected and converted to OCM with a k=1.4 factor. Crustal based on IMPROVE definition.
- Note that there are a lot of pies in areas of the country where there are no PM2.5 problems.
- Would be very useful to have measurement of NH3 (gas) in addition to NH4 (particulate)

- Sulfates (and associated ammonium) more prevalent in East
- Nitrates (and associated ammonium) more prevalent in Midwest and West.
- Carbon prevalent everywhere.
- Crustal a significant contributor to PM2.5 mass only in Arid regions in the Southwest.

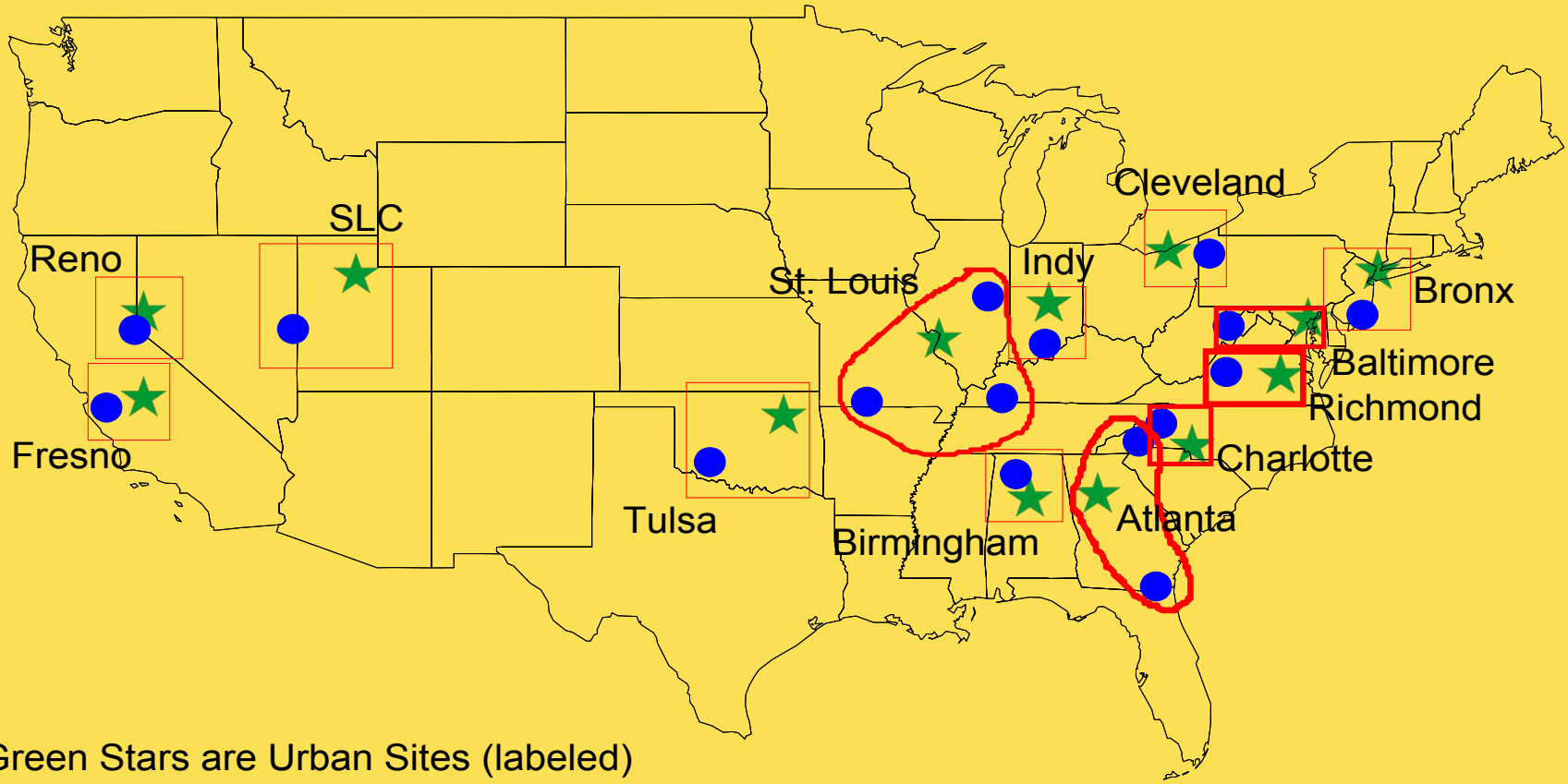
Urban Speciation Patterns



Talking points about next 3 Slides

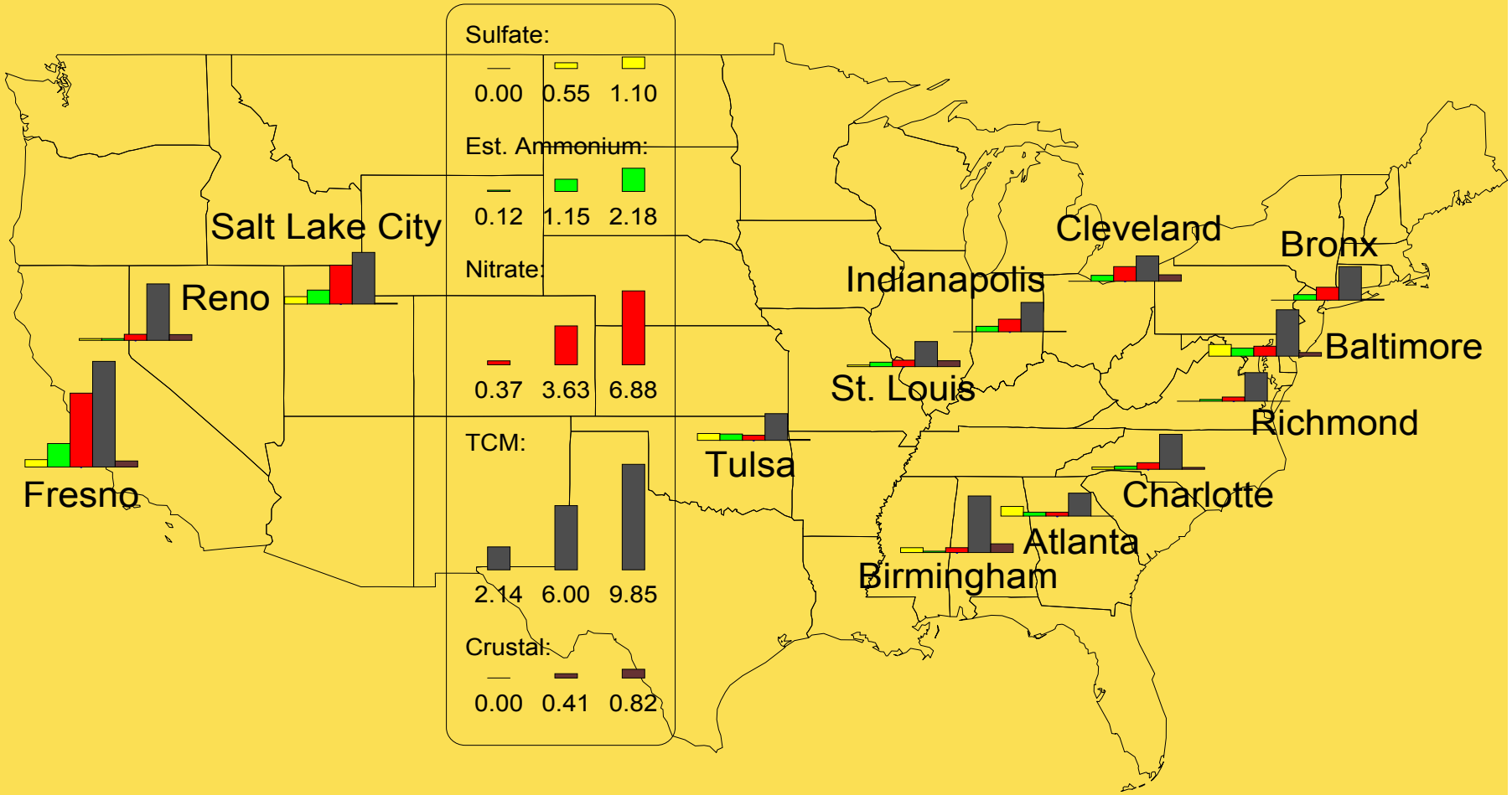
- **Specific urban sites were matched with rural sites to get estimates of urban excess:**
  - In all but two cases, one urban site matched with one representative (upwind) rural site.
  - In the case of St. Louis and Atlanta respectively, 3 and 2 representative rural sites used to determine regional concentrations of the species.
  - Urban sites chosen based on areas that have or will potentially have PM2.5 problems.
- **Total Carbonaceous Mass (TCM) is the major driver of urban excess everywhere.**
- **Excess nitrates play a role in the midwest and West.**
- **Sulfates show very little impact on urban excess, confirming the regional nature of the pollutant.**

13 Selected Urban Sites are Paired with Rural Sites for 'Urban PM2.5 Excess' Calculations

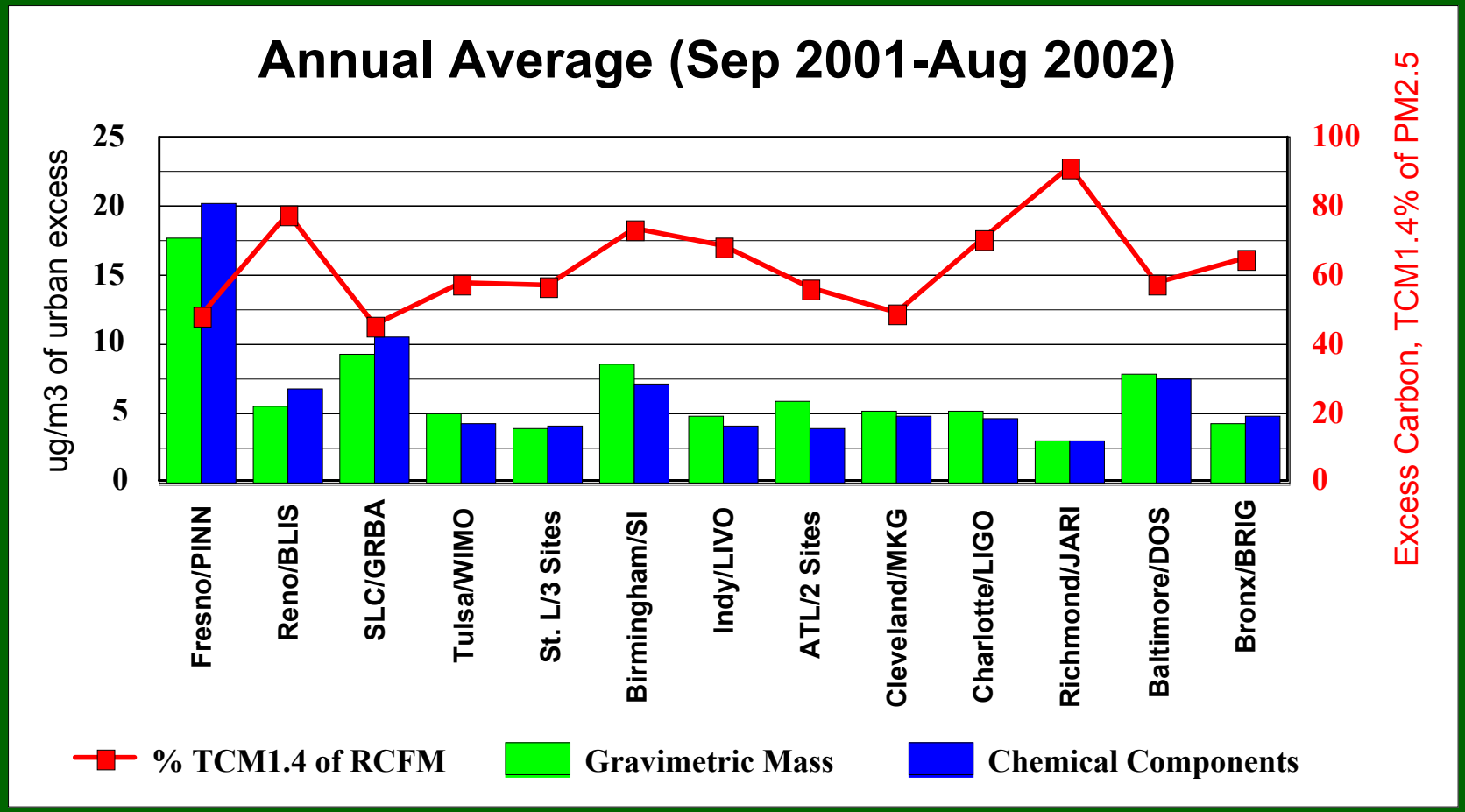


Green Stars are Urban Sites (labeled)
Blue Circles are Rural Sites

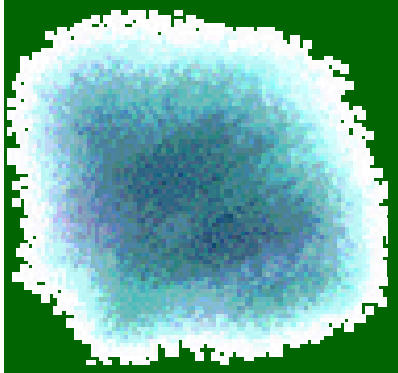
A quick look at annual average urban excess



Carbon is > 50-90% of Urban Excess

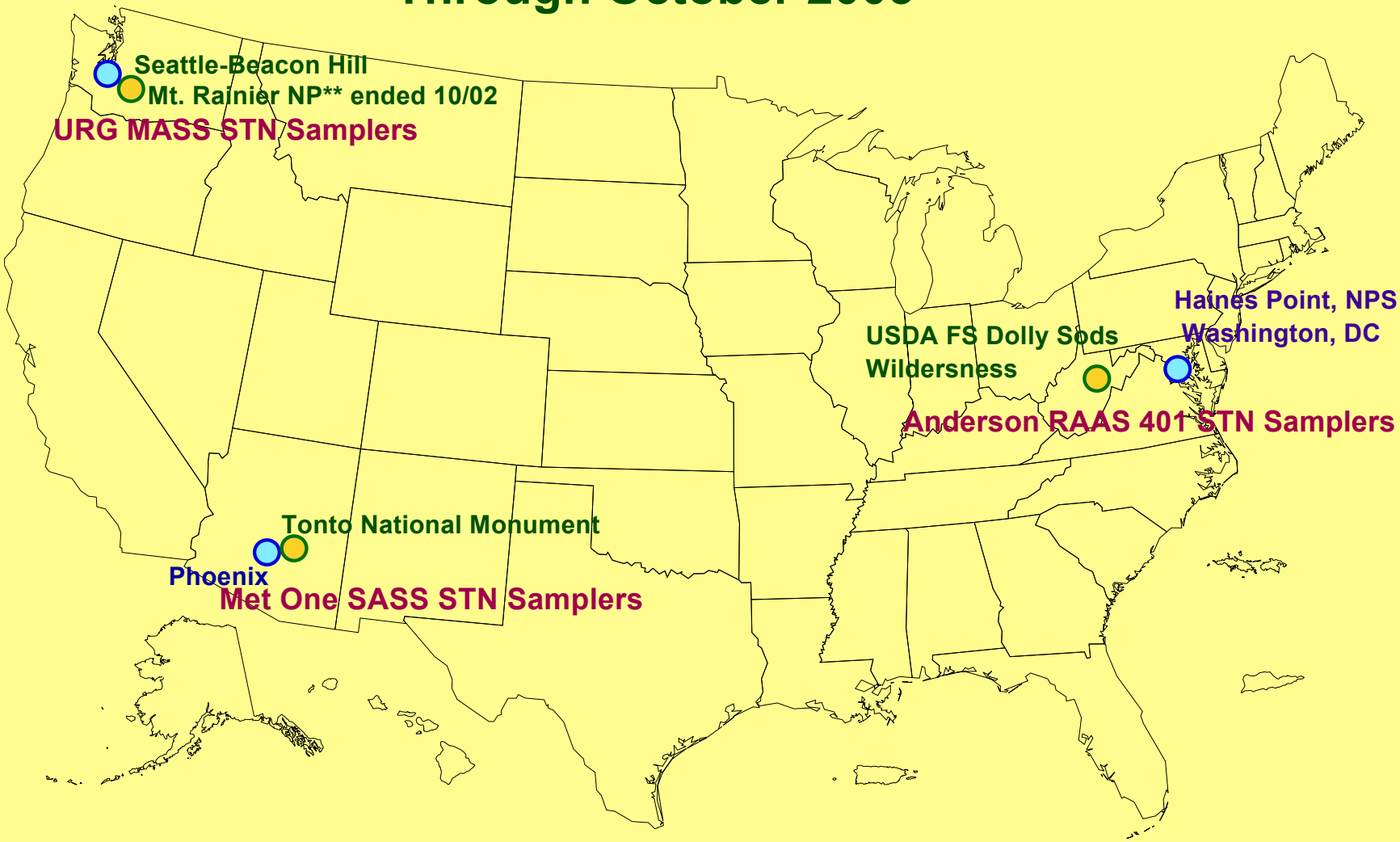


IMPROVE/STN Intercomparison



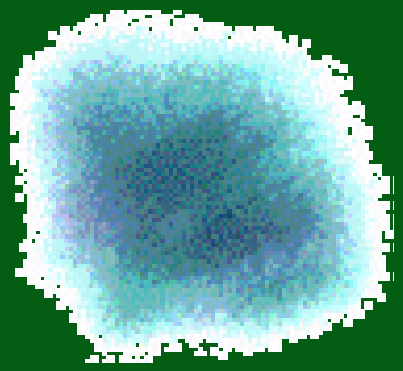
- Collecting data since fall ’01
- Now analyzing Oct ’01 - Sept ’02
- Hope to finish QA’ing first year data this fall; present papers late this year and early ’04.
- Expanding to 9 additional “STN” sites this fall.
- Conducting Shipping Study this fall and next summer.

IMPROVE/STN Monitoring Intercomparison Sites Through October 2003**



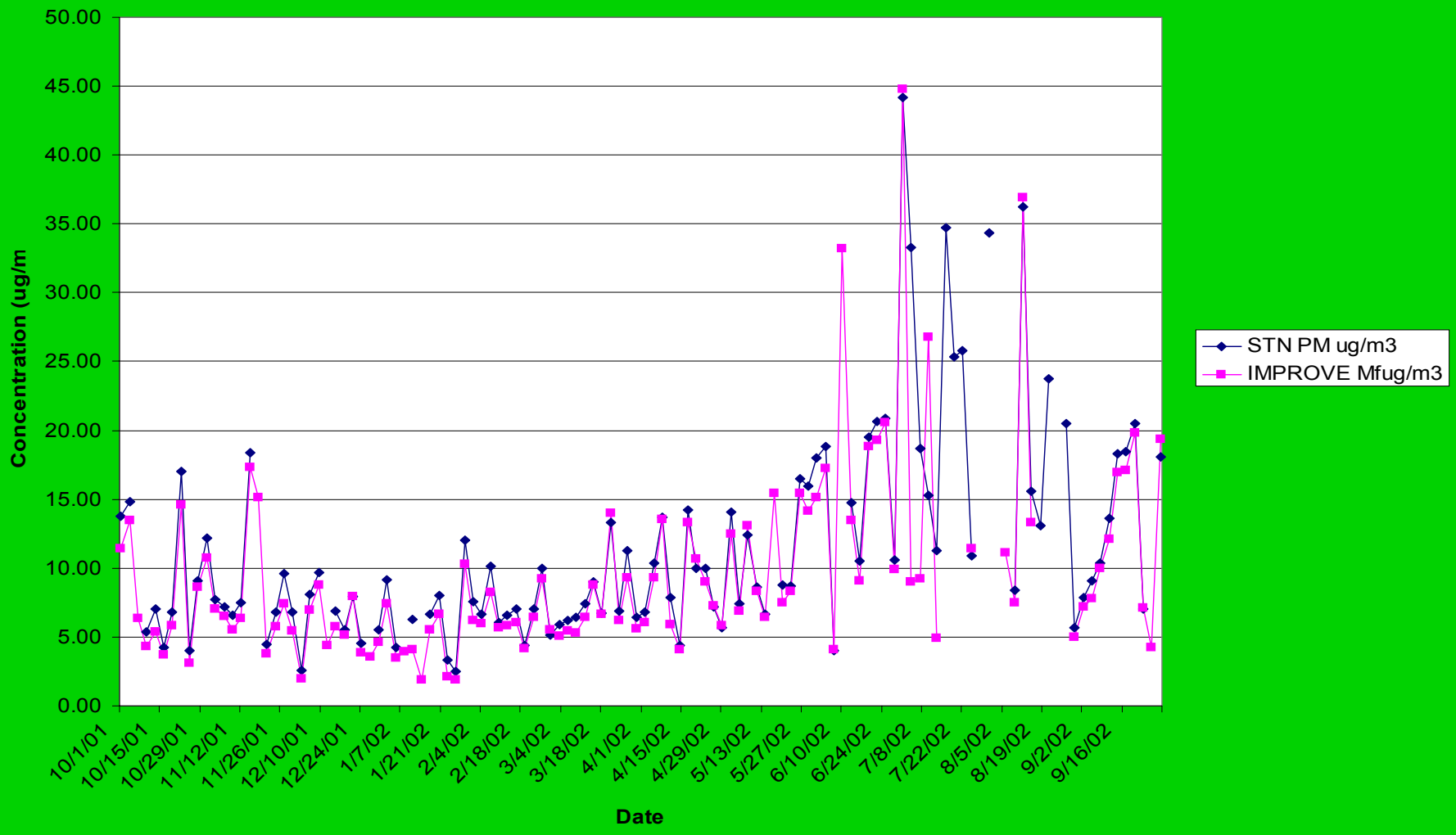
- Official or designated STN site, host to IMPROVE sampler
- Official IMPROVE site, host to STN sampler

New Urban IMPROVE Sites

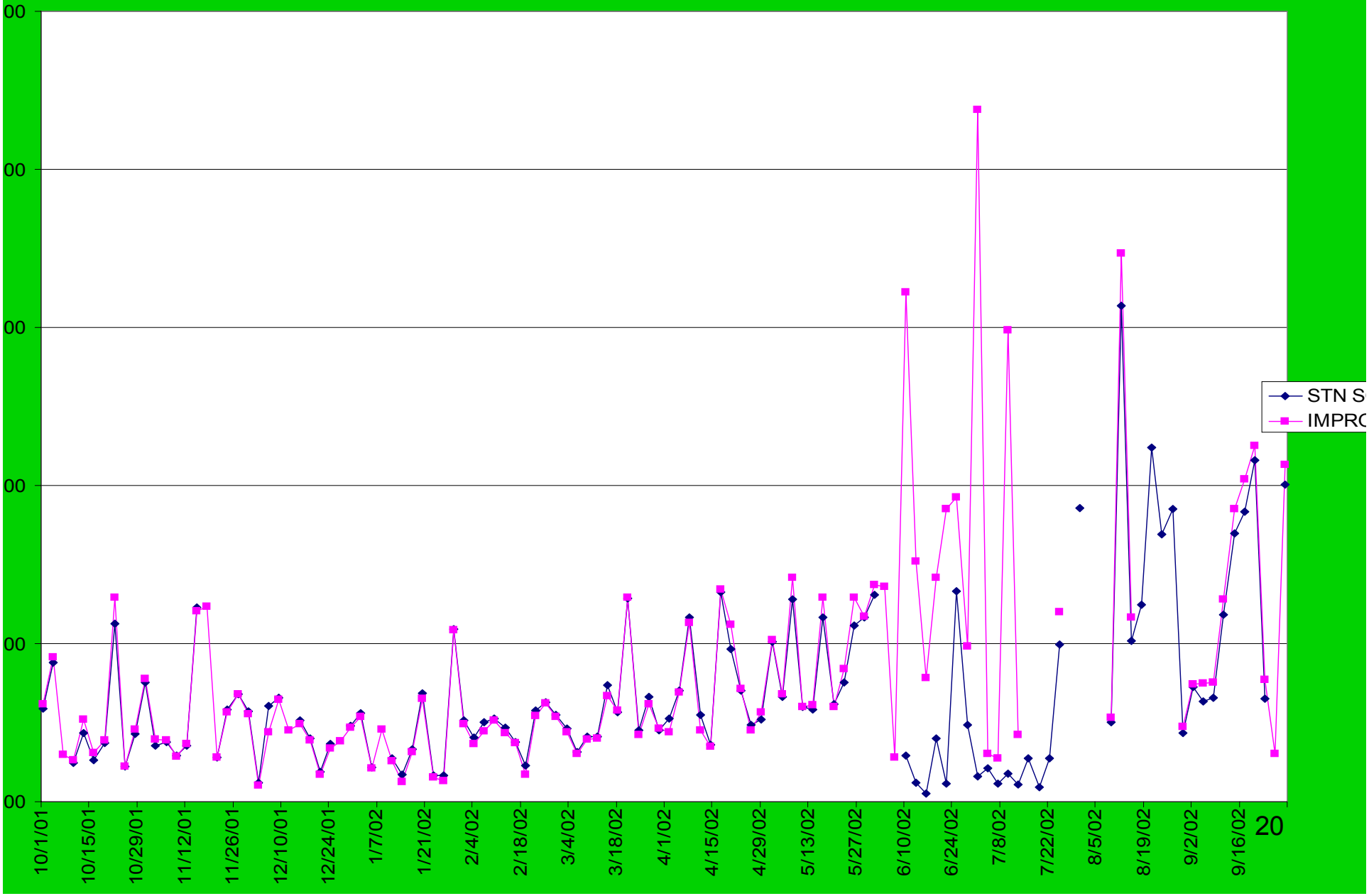


- New York City IS 52
- Atlanta S. Dekalb
- Pittsburgh BAPC
- Birmingham
- Detroit-Allen Park
- Chicago
- Houston-Deer Park
- Riverside-Rubidoux
- Fresno First St.

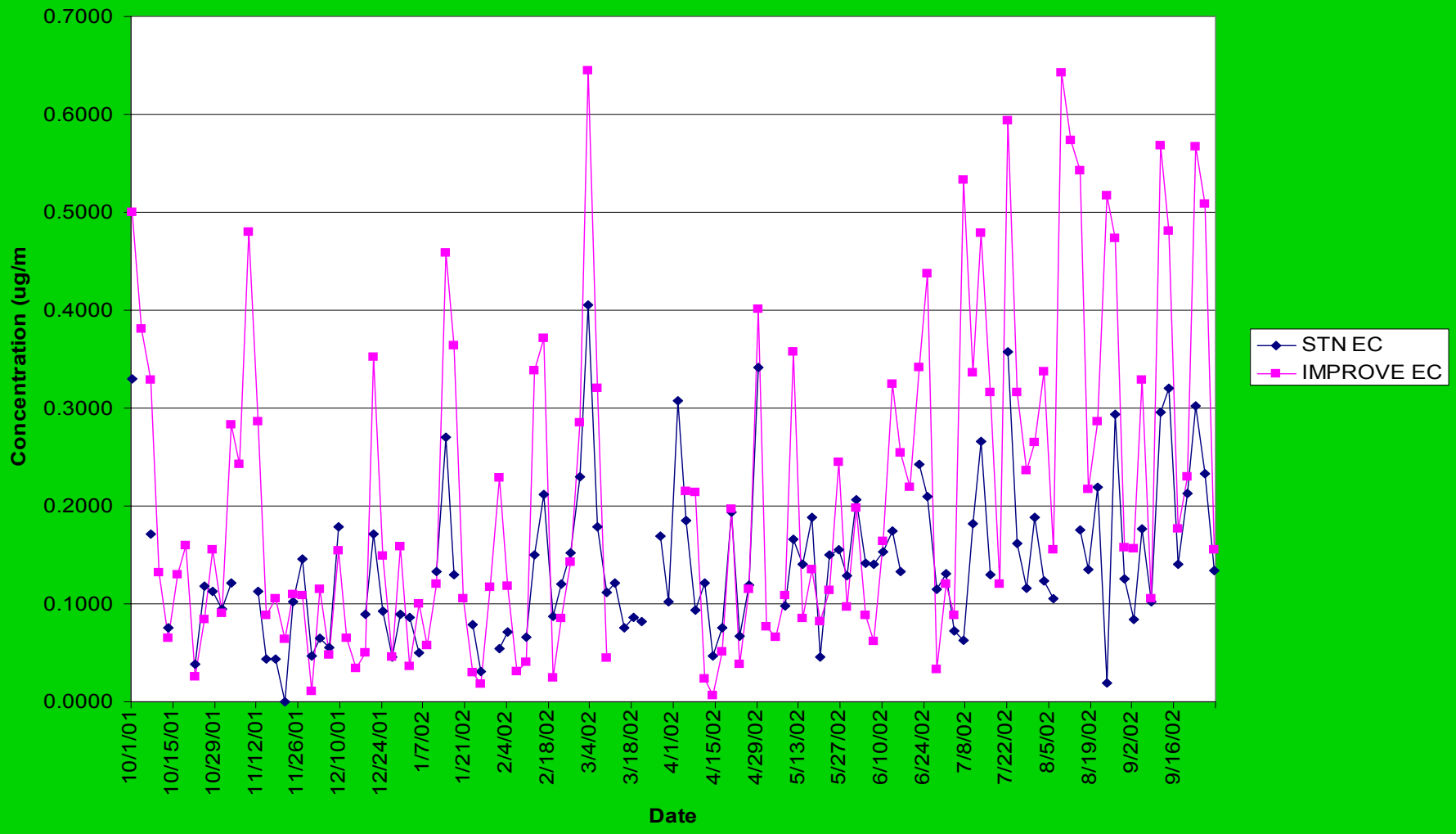
Chemical Speciation for STN vs. IMPROVE for PM2.5 at Dolly Sods from 10-01 to 9-02



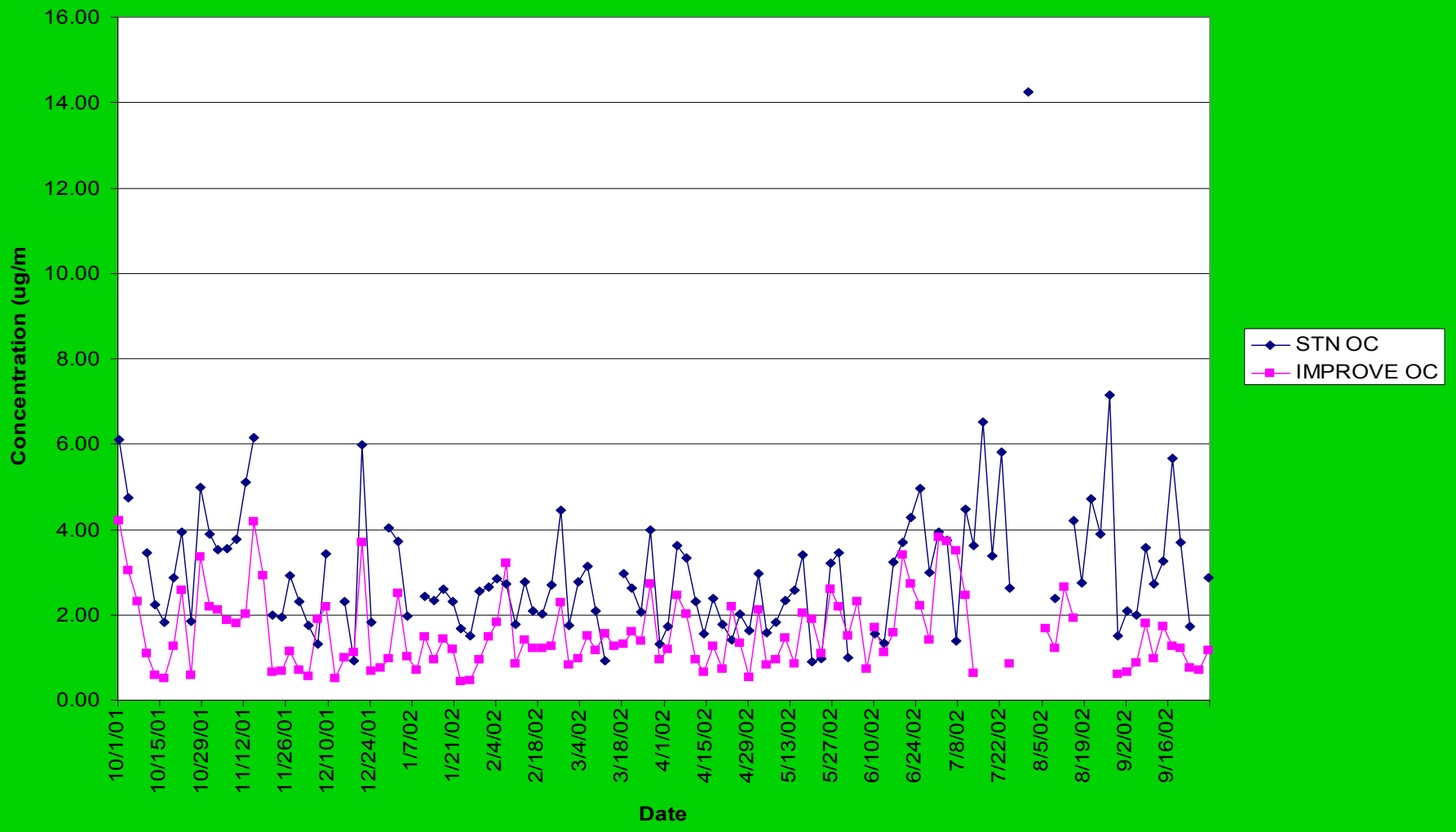
Chemical Speciation for STN vs. IMPROVE for Sulfate at Dolly Sods 10-01 to 9-02

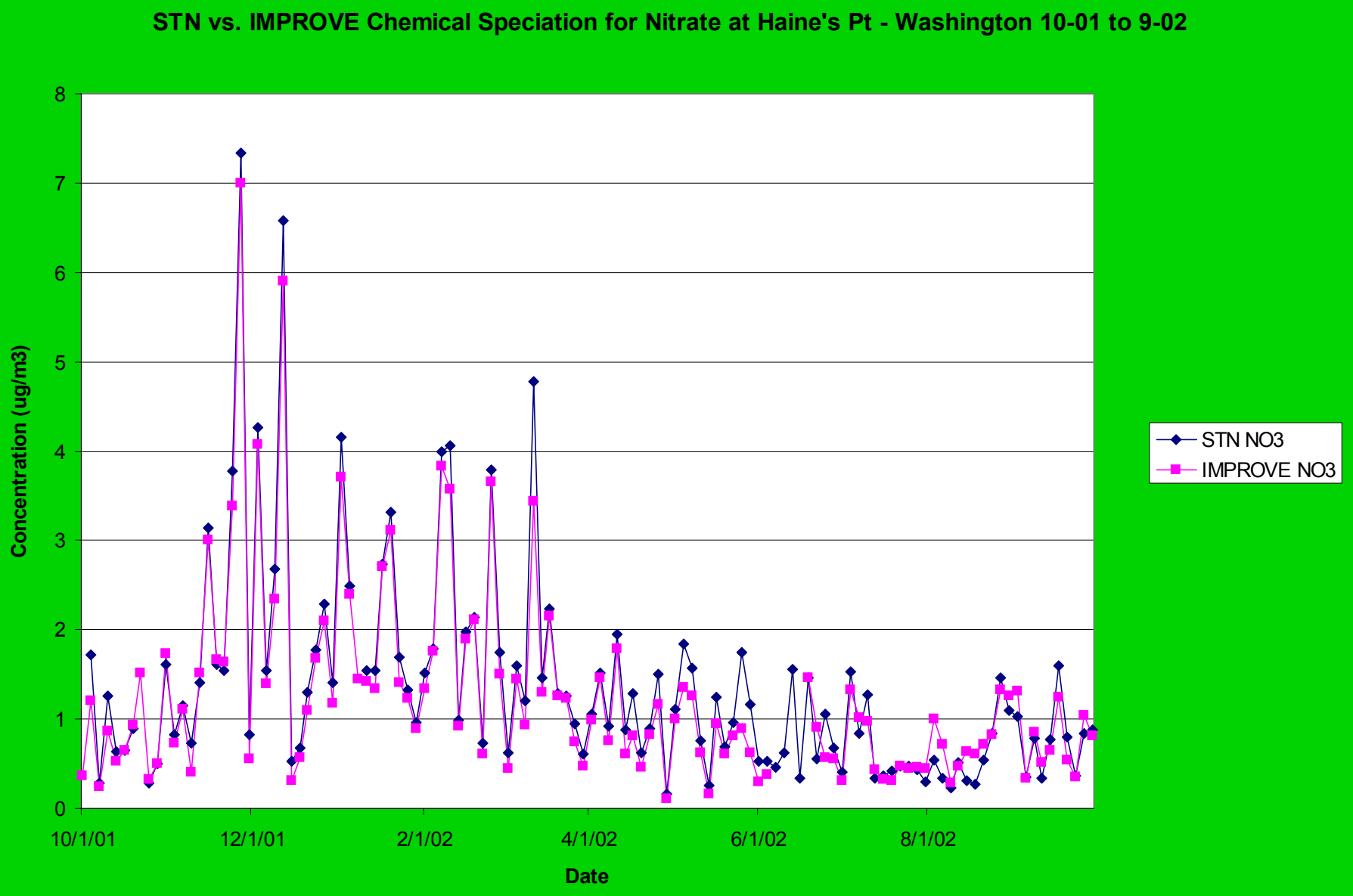


STN vs. IMPROVE Chemical Speciation for Elemental Carbon at Dolly Sods



Chemical Speciation for STN vs. IMPROVE for Organic Carbon at Dolly Sods from 10-01 to 9-02




STN vs. IMPROVE Chemical Speciation for Nitrate at Haine's Pt - Washington 10-01 to 9-02
Concentration (ug/m3)
0
1
2
3
4
5
6
7
8
10/1/01
12/1/01
2/1/02
4/1/02
6/1/02
8/1/02
Date
STN NO3
IMPROVE NO3