United States
Environmental Protection
Agency

Summary of PM$_{2.5}$ Speciation Network Assessment

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Speciation Network Re-Design Assumptions

- ## 50% reduction in number of supplemental speciation sites (SLAMS)
  - Based on NAAMS and 2005 grant budgets
  - 186 existing SLAMS
- ## Little to no changes to Trends sites
  - 54 existing Trends sites
- ## No changes to Improve network
  - 188 improve sites

Speciation Network Re-Design Approach

- Identify and map existing sites
- Objectively rank sites using a "Decision Matrix"
- Subjective review of existing sites
- Add new sites to meet needs

PM2.5 Speciation Sites in 2005
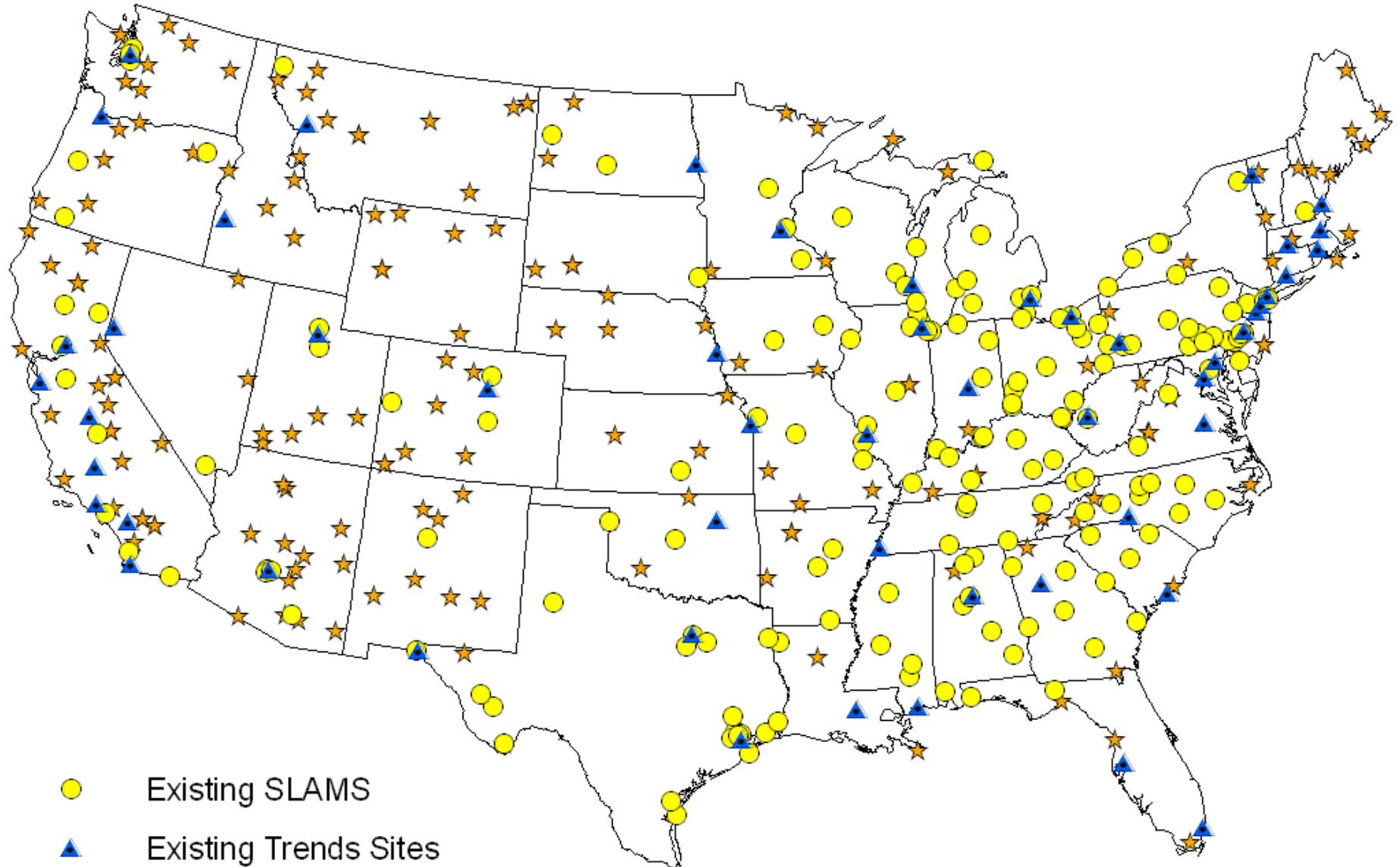
○ Existing SLAMS
▲ Existing Trends Sites
★ IMPROVE sites

Ranking of Existing Sites

- ## Used a multi-variable analysis to rank existing sites
  - Step 1. Identify and weight criteria that add value to a site
  - Step 2. Score each site for each criteria
  - Step 3. Rank each site based on the total score for all criteria

Ranking of Existing Sites (continued)

- ## What criteria were used?
  - Error in estimating PM2.5 concentration if monitor removed (25%)
  - Distance to nearest site (25%)
  - 3-year PM2.5 design value (15%)
  - Rate of change in monitored values (15%)
  - Population density near monitor (10%)
  - Collocation with PAMS and NATS (5% each)
  - 2010 residual non-attainment areas after CAIR (protected sites)
  - Trend site (protected)

- Proportionately
  - e.g., (Value-Min)/(Max-Min)
- Binning
  - e.g., (>NAAQS=1, >%80 NAAQS=0.5, <80% NAAQS=0)
- All or nothing
- Protected

Proportional Scoring Example

- Site 42-003-0008 had an average $PM_{2.5}$ concentration over 2001-2003 of 15.7 ug/m^3.

- The minimum average $PM_{2.5}$ concentration for all sites was 4 ug/m^3.

- The maximum average $PM_{2.5}$ concentration for all sites was 28 ug/m^3.

- The un-weighted score (from 0 to 1) is
  - (actual – min)/(max-min)
  - (15.7-4)/(28-4)= 0.49

- The weighted score is
  - un-weighted*weight
  - 0.49*0.25 = 0.12

Ranking of Existing Sites (continued)

Excerpt of Decision Matrix

AIRS	LOG of Distance		Frequency		Trends Site?		PAMS Site?		Resdual NA		Protect?		Avg. Conc.		Total	Rank	Percentile
120861016	1.6	0.12	3	0.06	Yes	1000	No	0.00	No	0.00	No	0	9.5	0.05	1000.23	49	82.02
510870014	1.0	0.07	3	0.06	Yes	1000	No	0.00	No	0.00	No	0	13.7	0.08	1000.21	50	81.65
471570047	1.0	0.07	3	0.06	Yes	1000	No	0.00	No	0.00	No	0	14	0.08	1000.21	51	81.27
270530963	1.2	0.09	3	0.06	Yes	1000	No	0.00	No	0.00	No	0	10.7	0.06	1000.21	52	80.90
490353006	1.0	0.07	3	0.06	Yes	1000	No	0.00	No	0.00	No	0	11.6	0.06	1000.19	53	80.52
410510080	1.0	0.07	3	0.06	Yes	1000	No	0.00	No	0.00	No	0	8.4	0.04	1000.16	54	80.15
261630033	1.0	0.07	3	0.06	No	0	No	0.00	Yes	0.20	500	19.5	0.13	500.56	55	79.78
010731009	1.5	0.12	3	0.06	No	0	No	0.00	Yes	0.20	500	12.6	0.07	500.45	56	79.40
010732003	1.1	0.08	3	0.06	No	0	No	0.00	Yes	0.20	500	16.7	0.11	500.44	57	79.03
261610008	1.5	0.12	3	0.06	No	0	No	0.00	No	0.00	500	14.6	0.09	500.26	58	78.65
380530002	2.3	0.19	3	0.06	No	0	No	0.00	No	0.00	500	5.5	0.01	500.26	59	78.28
160170005	1.9	0.15	3	0.06	No	0	No	0.00	No	0.00	500	6.8	0.02	500.23	60	77.90
170314201	1.0	0.07	3	0.06	No	0	Yes	0.10	Yes	0.20	0	13.3	0.08	0.61	61	77.53
180890022	1.6	0.12	3	0.06	No	0	Yes	0.10	Yes	0.20	0	17.1	0.11	0.59	62	77.15
240030019	1.4	0.10	3	0.06	No	0	Yes	0.10	Yes	0.20	0	13	0.08	0.54	63	76.78
390490081	2.0	0.16	3	0.06	No	0	No	0.00	Yes	0.20	0	15.9	0.10	0.52	64	76.40
130210007	2.1	0.17	3	0.06	No	0	No	0.00	Yes	0.20	0	15.2	0.09	0.52	65	76.03
210670012	2.0	0.16	3	0.06	No	0	No	0.00	Yes	0.20	0	14.9	0.09	0.51	66	75.66
132450091	2.0	0.16	3	0.06	No	0	No	0.00	Yes	0.20	0	14.7	0.09	0.51	67	75.28
130590001	2.0	0.15	3	0.06	No	0	No	0.00	Yes	0.20	0	15.6	0.10	0.51	68	74.91
470654002	1.9	0.15	3	0.06	No	0	No	0.00	Yes	0.20	0	15.2	0.09	0.51	69	74.53
370350004	1.9	0.15	3	0.06	No	0	No	0.00	Yes	0.20	0	15.5	0.10	0.50	70	74.16
420710007	1.6	0.12	3	0.06	No	0	No	0.00	Yes	0.20	0	17	0.11	0.49	71	73.78

Objective Ranking of Existing Sites

Legend:
- ▲ Trends sites
- ● Low value SLAMS
- ● High value SLAMS
- ★ IMPROVE sites
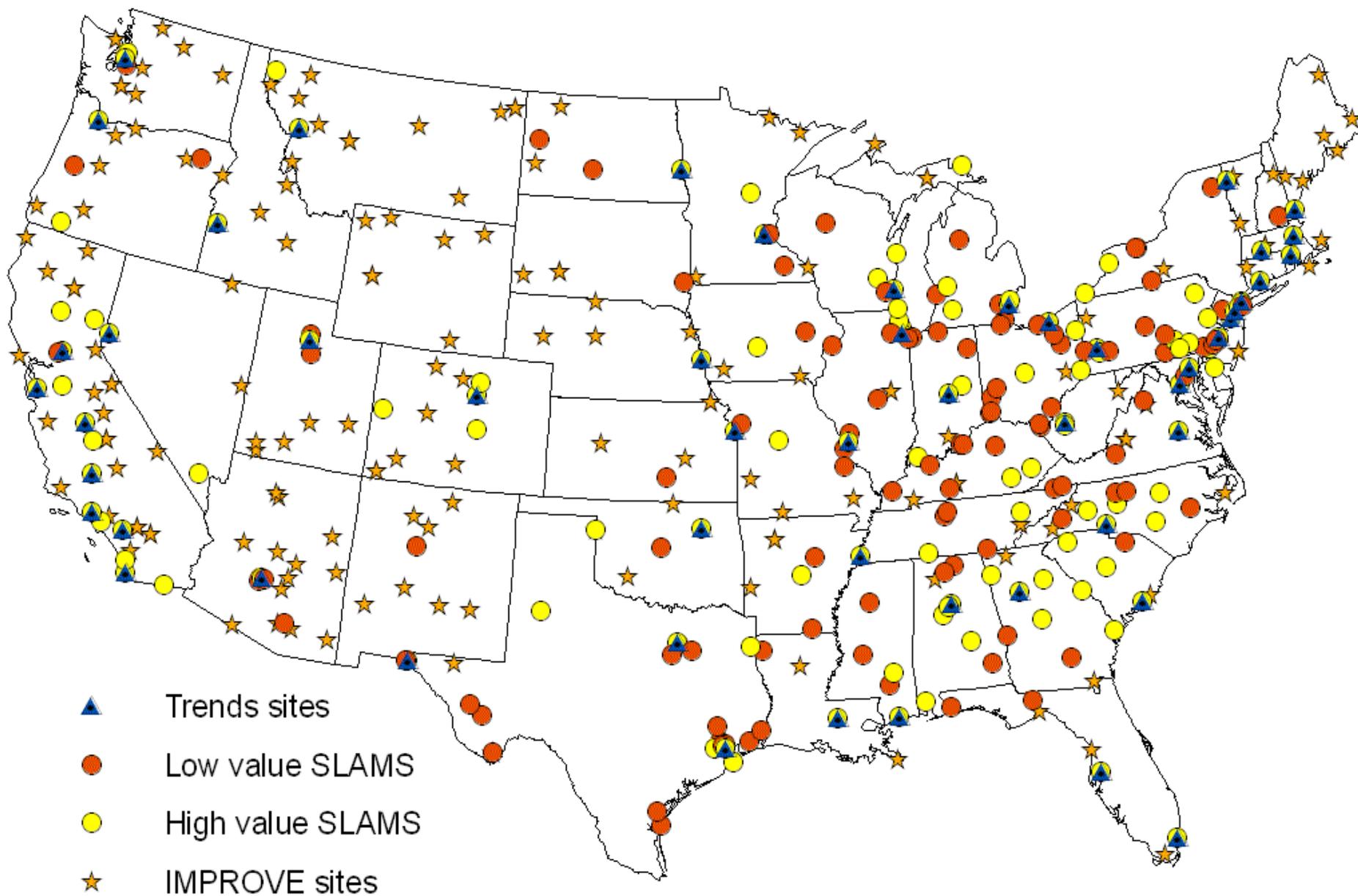
Subjective Review of Sites

- "Low value" sites were the primary removal targets
  - We removed all low value sites
  - We further removed apparent "redundant" sites (where numerous low or high value sites are close together)
  - We also removed some trends sites which appeared to be unnecessary
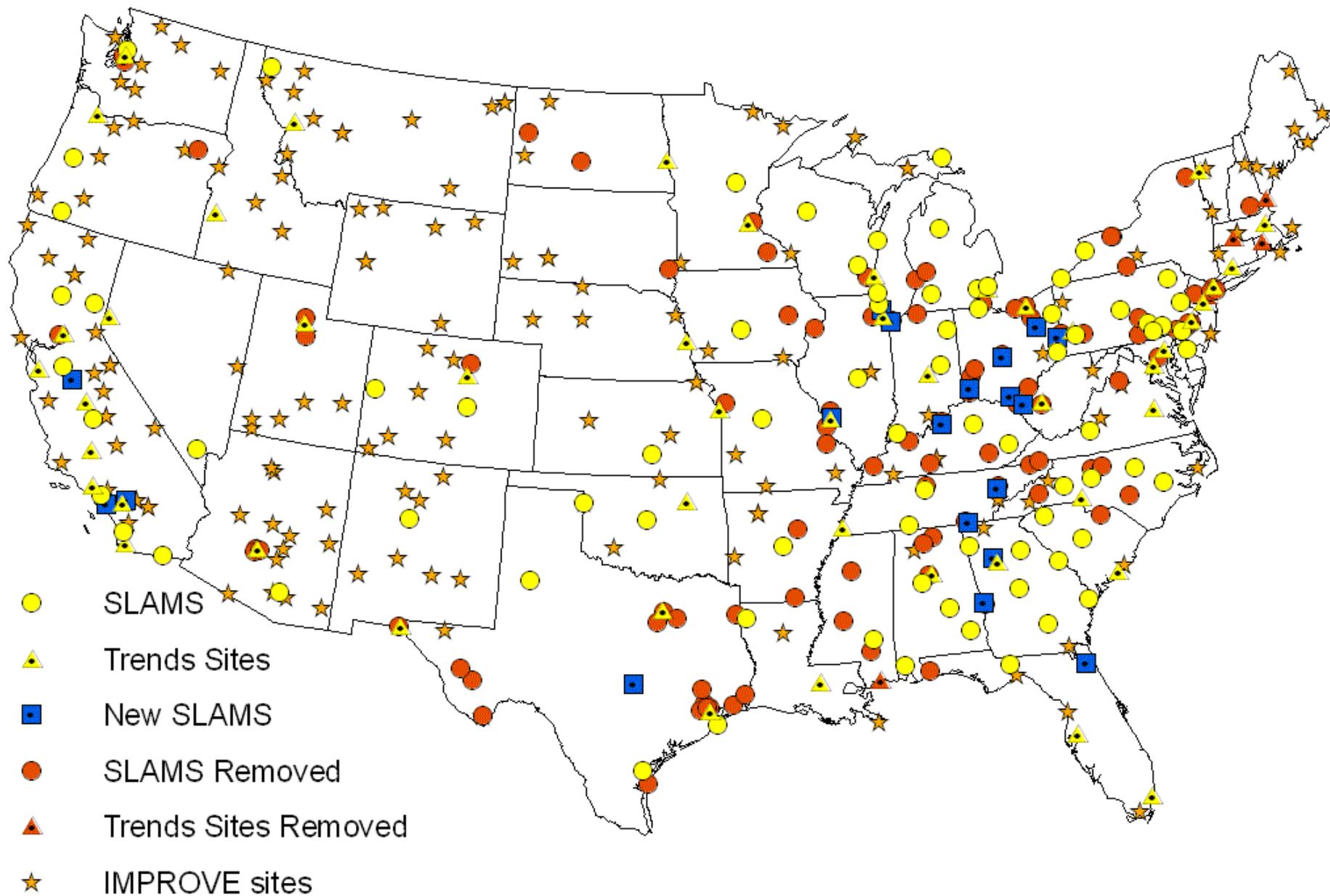
Subjective Review
Adding New Sites to the Network

- ## New sites were added to the network based on the following criteria:
  - ### Remaining PM2.5 nonattainment in 2010 after CAIR (based on final CAIR modeling)
    - This was done on a monitor by monitor basis
    - We made sure that each predicted future year nonattainment county had at least one speciation monitor nearby (some have more than one)
  - ### Large cities
    - We identified a few large cites that did not have a speciation monitor
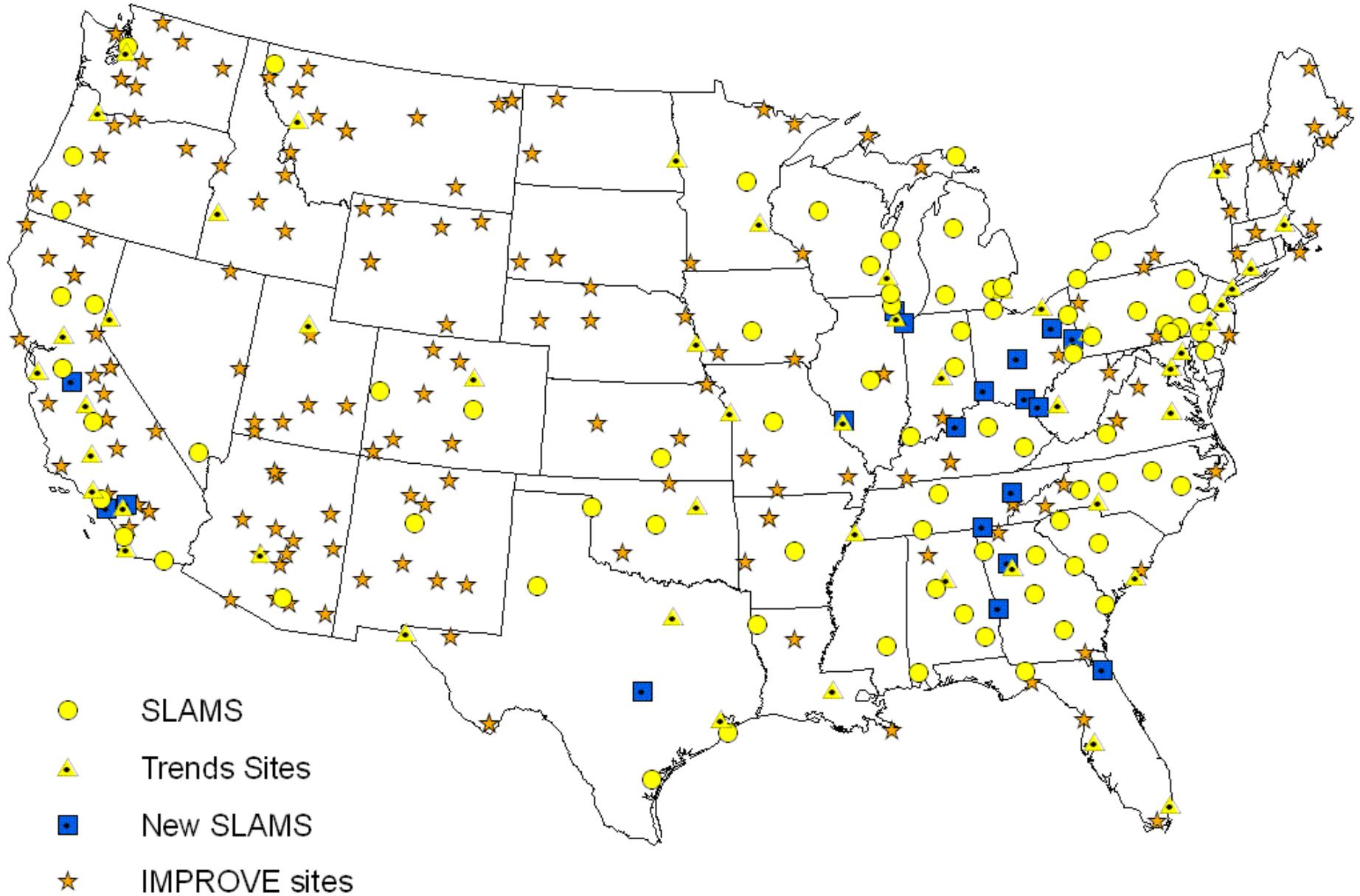
Subjective Review
Adding Existing Sites Back

– Low value sites were added back into the network based on the following criteria

- Large cities - We tried to keep a speciation monitor in most cities with >250,000 population

– Fill Holes

- Removing some low value sites left large gaps in the network

    – We tried to balance the need to have some low concentration rural sites with the need to keep high concentration urban sites

– Keep certain rural sites that were deployed based on EPA recommendations when the network was designed in 2001

- These were mostly "hole filling" sites

Final Ranking of Sites

Legend:
- ○ SLAMS
- △ Trends Sites
- ■ New SLAMS
- ● SLAMS Removed
- ▲ Trends Sites Removed
- ★ IMPROVE sites

Final Network Design Recommendation

Legend:
- ● SLAMS
- ▲ Trends Sites
- ■ New SLAMS
- ★ IMPROVE sites

What Did this Assessment Lead To?

- Just the first step in redesign

- Negotiated with States and Regions to reach concurrence on network changes

- Grant guidance for 06 and 07 based on final negotiated changes