

June 11, 2001

MEMORANDUM

SUBJECT: Status of the National PM_{2.5} Speciation Monitoring Network

FROM: J. David Mobley, Acting Director
Emissions, Monitoring, and Analysis Division (MD-14)

TO: Deputy Director, Office of Ecosystem Protection, Region I
Director, Environmental Planning and Protection Division, Region II
Director, Air Protection Division, Region III
Director, Air, Pesticides, and Toxics Management Division, Region IV
Director, Air and Radiation Division, Region V
Director, Multimedia Planning and Permitting Division, Region VI
Director, Air, RCRA and Toxics Division, Region VII
Director, Air and Radiation Program, Region VIII
Director, Air Division, Region IX
Director, Office of Air, Region X
Acting Director, Office of Environmental Measurement and Evaluation, Region I
Director, Environmental Services and Assessment Division, Region II
Director, Environmental Services Division, Regions III and VII
Director, Science & Ecosystems Support Division, Region IV
Director, Resource Management Division, Region V
Assistant Regional Administrator, Management Division, Region VI
Assistant Regional Administrator, Office of Technical and Management
Services, Region VIII
Assistant Regional Administrator, Office of Policy and Management, Region IX
Director, Office of Environmental Assessment, Region X

The purpose of this memorandum is to report the current status of the PM_{2.5} speciation monitoring network(s). In terms of numbers of monitors, spatial coverage, and the process for deriving data, the program has made significant progress over this past year and is poised for complete deployment by December 31, 2001.

Summary of Progress

Fifty-two of the 54 planned trends sites are operating or will begin sampling as soon as filter modules can be supplied by the vendors. Two sites are being relocated. In the IMPROVE and IMPROVE protocol monitoring network, over 90 percent of its 145 sites targeted for 2001 are deployed and the remainder should be deployed by year's end. Of approximately 200 planned supplemental speciation network sites, which includes some of the IMPROVE protocol sites mentioned above, over 30 of these sites are currently operating and 135 additional sites have been identified. A number of Tribal Agency sites have been programmed for rural speciation monitors this year or IMPROVE protocol monitors in 2002. A full assessment of the current design and deployment of the PM_{2.5} speciation network is attached.

Work to be Done

Several studies are underway to help EPA and our partners interpret and present the data that are generated for public consumption and optimize these networks in years to come. However, considerable work remains in the design and deployment of the State and local supplemental sites. Please ensure that your States have ordered the supplemental speciation monitors that they would be expected to deploy and have submitted complete design plans. We will be working with your staffs to help State, local, and Tribal agencies complete the design of the system by July 1, 2001 and deploy all the monitors by the end of this calendar year. Please work with your staff to ensure that these activities are completed on schedule.

The success achieved to date is a result of a lot of hard work by a long list of State and local agencies, Tribal agencies, Regional Planning Organizations (RPO's), and the staff at EPA Regional Offices and OAQPS. Critical support regarding IMPROVE and the siting of IMPROVE protocol monitors has been provided by the National Park Service, the Fish and Wildlife Service, the Bureau of Land Management, the USDA Forest Service, and NOAA. Your continued support towards full implementation of the PM_{2.5} speciation network is greatly appreciated.

In addition, please refer to my memorandum of April 27, 2001 which summarizes the status of the PM_{2.5} mass network and data reporting issues. We have also made significant progress in the deployment and operation of PM_{2.5} continuous mass monitors for daily reporting to the public using the Air Quality Index, which I will address in a future memorandum. General questions regarding this memorandum may be directed to Dennis Crumpler (919/541-0871) or Lee Byrd (919/541-5367) of my staff; contacts for specific issues are included in the attachment.

Attachment

cc: Directors, Regional Planning Organizations
Regional Office Monitoring Contacts
Regional Office Modeling Contacts
Regional Office Air Program Managers
Regional Tribal Air Coordinators
Regional Air Grant Coordinators
TAMS Steering Committee Members
John Bachmann, OAQPS/OD
Bill Becker, STAPPA/ALAPCO
Lee Byrd, OAQPS/MQAG
Tom Curran, OAQPS/OD
Fred Dimmick, OAQPS/AQTAG
Darrel Harmon, OAR Tribal Program
Jed Harrison, ORIA
Bill Lamason, OAQPS/EMAD
Virgil Masayesva, Tribal Air Monitoring Support Center
Geri O'Sullivan, STAPPA/ALAPCO
Joe Paisie, OAQPS/AQSSD
Marc Pitchford, OAQPS/MQAG, LV
Rich Scheffe, OAQPS/MQAG
Marc Scruggs, NPS
Nancy Seidman, STAPPA Monitoring Co-Chair
John Seitz, OAQPS/OD
Ieva Spons, OAQPS/OD
Joe Tikvart, OAQPS/AQMG
Lydia Wegman, OAQPS/AQSSD
Nancy Wentworth, OEI
Mel Zeldin, ALAPCO Monitoring Co-Chair

June 2001 Status of PM_{2.5} Speciation Monitoring Network

What does the current network look like?

Trends, Daily/Continuous Sites and Supersites

Figure 1 shows the location of the current Trends sites, the Continuous/Daily sites selected to date, Supersites, and currently known urban supplemental speciation sites. Fifty-four trends sites have been established, 45 are on line, 9 sites are awaiting delivery of the monitors or filter modules. Specific locations have not been determined for sites at Portsmouth, New Hampshire, and New Haven, Connecticut. We believe that all the currently inoperative sites should be running before summer's end. The State and local agencies that host 13 of the Trends sites and 1 supplemental site have also agreed to operate collocated continuous monitors that measure hourly concentrations of carbon, sulfates, and nitrates on a daily basis. This is a long-term study designed to determine the feasibility of using continuous monitors as substitutes for filter-based sampling monitors. Four sites will begin the hourly carbon and nitrate monitoring by summer's end and the remainder of the sites will begin by the end of the year. Late in the year, we expect to begin deployment of continuous sulfate instruments as they become available.

Several universities and research organizations--with support from EPA, and State and local agencies--have initiated intensive monitoring studies in seven urban areas designated as Supersites. These studies are designed to collect a large amount of ambient data to characterize the physical and chemical properties of PM_{2.5} mass. This spring and summer, four of the Eastern sites--Baltimore, New York City, Pittsburgh, and St. Louis--will conduct an intensive monitoring study, and several SLAMS (State and Local Monitoring Sites) and IMPROVE sites will be providing Regional background data.

The results of these studies and on-going research will support instrument and methods development as well as health effects research.

Supplemental State and Local Ambient Monitoring Sites

Over 200 sites have been planned for deployment of speciation monitors that will take samples on 1-in-3 or 1-in-6-day cycles. (This program will include approximately 25 IMPROVE protocol sites, described later.) The non-IMPROVE protocol sites are called supplemental SLAMS sites shown on Figure 1. Thirty of the SLAMS sites are operational. Site locations have been identified for an additional 105 monitors, and complete design plans are forthcoming for New York, New Jersey, Pennsylvania, Kentucky, and Arkansas. Even though not all design plans have been officially submitted, at least 140 supplemental speciation monitors have been ordered or requested for approval through the Regional Offices. The total size of the network will likely be around 170 - 180 speciation samplers plus the IMPROVE protocol sites.

A number of States have requested that their supplemental sites use continuous or sequential samplers as opposed to the 1-in-3 or 1-in-6-day filter-based instruments. We anticipate that the results of our own current internal studies and the Supersite studies this summer will enable us to correlate the performance and resulting data from sequential and continuous samplers with those of the filter-based instruments. If so, the alternate samplers will be strongly supported.

The IMPROVE or IMPROVE Protocol Network, and Further Network Expansion in Rural Areas

Figure 2 shows the IMPROVE and IMPROVE protocol network design, as it currently exists, and is expected to expand. The IMPROVE monitors were the first ones deployed to measure fine particulate and some of its precursors as a means to characterize visibility impairment or regional haze. In collaboration with the Federal Land Managers (FLM's) and more recently with State and Tribal governments, the network design expanded to 145 target sites in 2001. This is divided into 110 operated by the FLM's in or near Class I areas, and another 35 operated by State, Tribes, FLM's, and EPA-funded contractors at non-Class I area sites. To date, 132 sites have been deployed and are operative, including the conversion of 8 CASTNET sites to IMPROVE Protocol sites. The remaining stations should be installed this year.

In the Fall of 2000, several of the Regional Planning Organizations (RPO's) asked EPA for more additional monitoring stations in rural areas. In response to this request and to accommodate the needs of Tribal agencies, David Mobley issued a memo on November 27, 2000, calling for site nominations. The EMAD's Air Quality Modeling Group (AQM) used modeling to identify areas in which monitors are needed to better characterize spatial concentration gradients, locally high levels of PM_{2.5} total mass measurements, and rural area background concentrations for evaluating long-range transport. David Mobley issued a memorandum on March 6, 2001, describing this analysis.

As a result of the collaborative efforts with the RPO's and Tribes to address the shortage of rural speciation monitors, 16 new IMPROVE protocol sites were requested and approved for deployment in 2002. Figure 2 shows that most of the newly requested IMPROVE protocol sites will be located in the country's mid-section.¹

Also, in conjunction with the modeling evaluation by AQMG, several States and Tribes have chosen to deploy speciation monitors at rural area sites. They tend to be scattered in the Midwest, East, and South and will be deployed by the end of this year. Note that two background concentration sites--one near the North Carolina/Virginia border and one in east-central New York State--are of interest to us but have yet to be included in these States' design plans.

¹Region IX has reported that two more IMPROVE protocol sites will be requested for Tribal Lands in Western and West-Central Nevada next year. A prospective IMPROVE protocol site in Tennessee has been mentioned in discussions with Region IV, but Tennessee has not officially requested it.

Operational Procedures and Infrastructure

We have worked out most of the issues with handling and analyzing the filters from the speciation monitors through a contract with the Research Triangle Institute (RTI). Filters from the IMPROVE monitors will be processed through the University of California at Davis (UC Davis). RTI will also handle the loading of all the speciation monitor data in AIRS which, in conjunction with State/local/Tribal review, should streamline this procedure for all parties. We are working toward a similar process for entry of IMPROVE data into AIRS by UC Davis.

The quality assurance management plan for the Trends network was finalized in January 2001. We intend it to be a template for the supplemental SLAMS-based sites. The Quality Assurance Project Plan (QAPP) for the IMPROVE network sites is also applicable to IMPROVE Protocol sites. We have identified a few parts of the IMPROVE QAPP that need upgrading and have begun that process.

Special Studies and Additional Work Needed

Several important studies have been initiated by EMAD to support the ultimate success of the speciation networks. These include: (1) comparing results derived from the different makes of instruments and equipment with different sampling mechanisms--single day versus sequential samples, (2) comparing results between continuous monitors and filter based measurements, with particular interest in elemental and organic carbon, (3) comparing results between IMPROVE and speciation monitors, and (4) determining what data analyses are relevant and most important to our client groups and data quality objectives.

Figure 3 and Table 1 show the composite picture of all the currently designed network(s) when deployed. Please continue to work with the State and local agencies, the Tribal governments, and RPO's to confirm the locations of yet specified supplemental or IMPROVE Protocol sites and possibly filling in some gaps in the network for air quality modeling evaluation. We would like to see each State complete its design plans by July 1, 2001. This will allow adequate time for adjustments, approval, and ordering of the instruments. The OAQPS/EMAD staff will continue to assist Regions, States, and Tribes in resolving network design questions, technical questions regarding monitoring equipment, quality assurance, and funding. Specific contacts and telephone numbers are as follows:

<u>Topic</u>	<u>Person</u>	<u>Phone No.</u>
All Program Elements	Rich Scheffe	919-541-4650
Overall Network Design	Dennis Crumpler	919-541-0871
Air Quality Modeling Interface	Brian Timin	919-541-1850
IMPROVE & IMPROVE Protocol Network Design & Funding	Neil Frank	919-541-5560
IMPROVE Monitoring Technical Issues	Marc Pitchford	702-895-0432
Speciation Monitoring Equipment-Filter or Continuous ..	Jim Homolya	919-541-4039
Continuous Monitor Analytical Methods and Issues-Carbon, Sulfates, Nitrates	Joann Rice	919-541-3372
Quality Assurance	Dennis Mikel	919-541-5511
Network Design and Funding	Lee Ann Byrd	919-541-5367

Conclusions

We have accomplished a great deal to date. The 54-site Trends network is nearly completely deployed and operating, and the IMPROVE/IMPROVE protocol network is better than 90 percent complete with respect to this year's targeted sites. The State and local supplemental network is growing, but considerable work must be done to complete the design by July 1, 2001, which will enable deployment by the end of 2001. Any of several factors may change the design number and locations of supplemental speciation sites, but the final number of sites appears to be 170-180 plus 32 IMPROVE protocol sites this year and another 17 in 2002. Coincident with deployment of the speciation network, EMAD has initiated several studies, which along with the Supersites studies this summer, will help us understand the differences in data from the several monitors that are in use and may ultimately lead to deployment of less labor intensive sequential or continuous samplers in many locations. We look forward to seeing the information unfold as the PM_{2.5} speciation data are generated and analyzed.

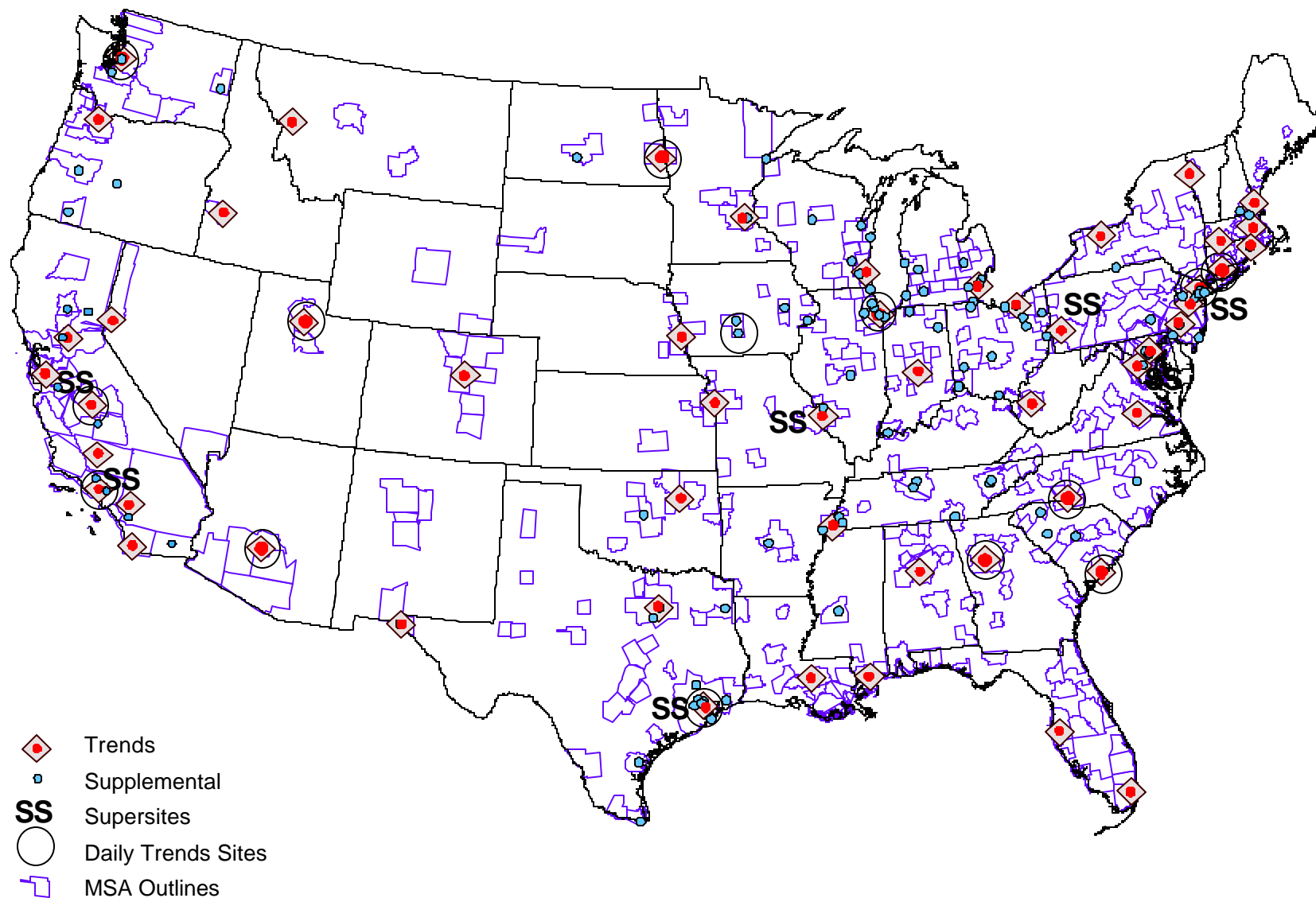
Acknowledgments

The successful implementation of the PM speciation monitoring network and the IMPROVE network is due to the efforts of numerous State and local agencies, Tribal agencies, the RPO's, the staff at EPA Regional Offices and OAQPS, the National Park Service, the Fish and Wildlife Service, the Bureau of Land Management, the USDA Forest Service, and NOAA. These efforts are greatly appreciated.

Figure 1. Current/Planned Urban PM_{2.5} Speciation Sites

Includes Trends, Supplemental, Daily Continuous and Supersites. Add'l sites will be added as network plans are finalized.

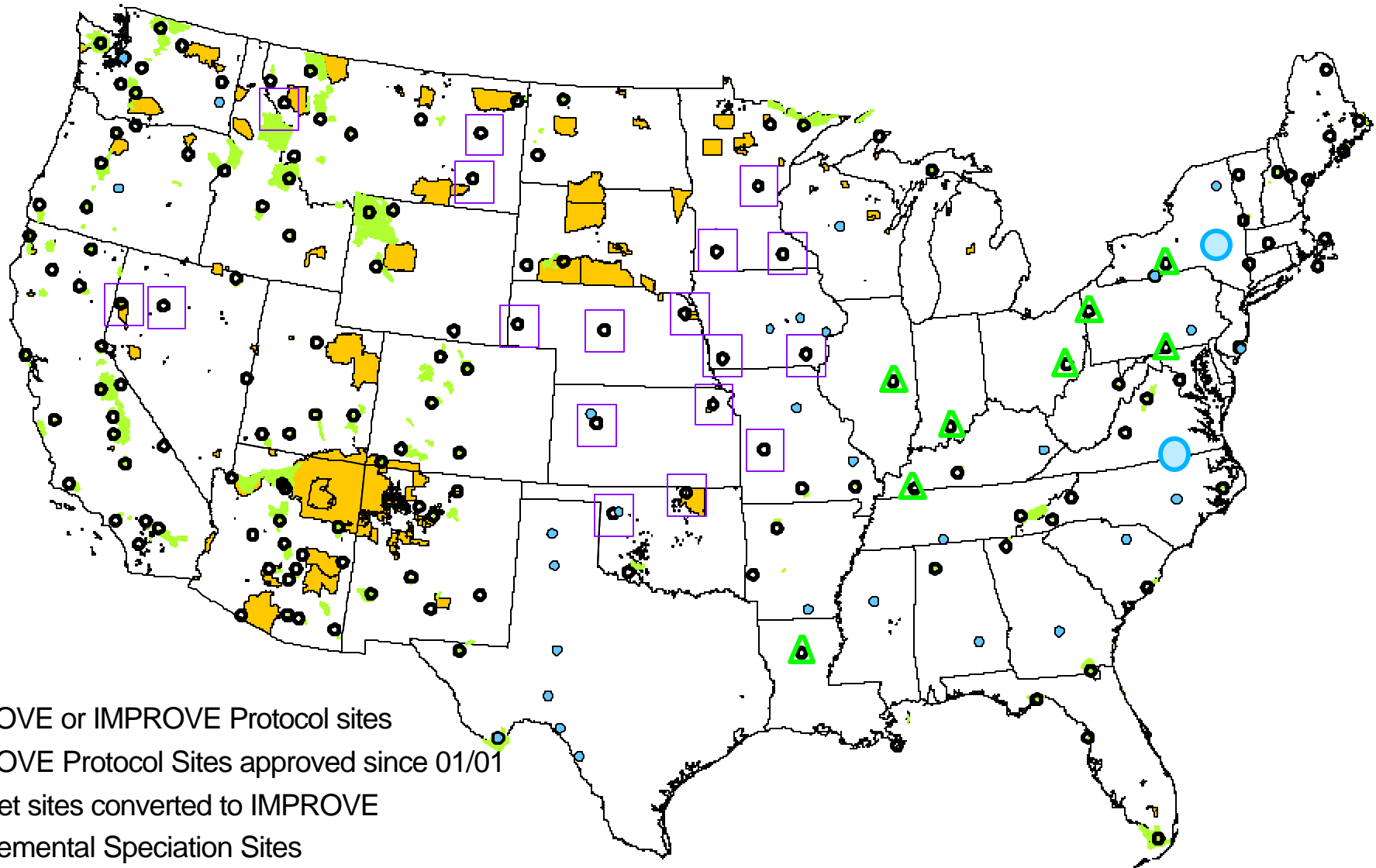
Many site locations are estimated.



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Figure 2. Current/Planned IMPROVE, IMPROVE Protocol & Rural Supplemental PM_{2.5} Speciation Sites

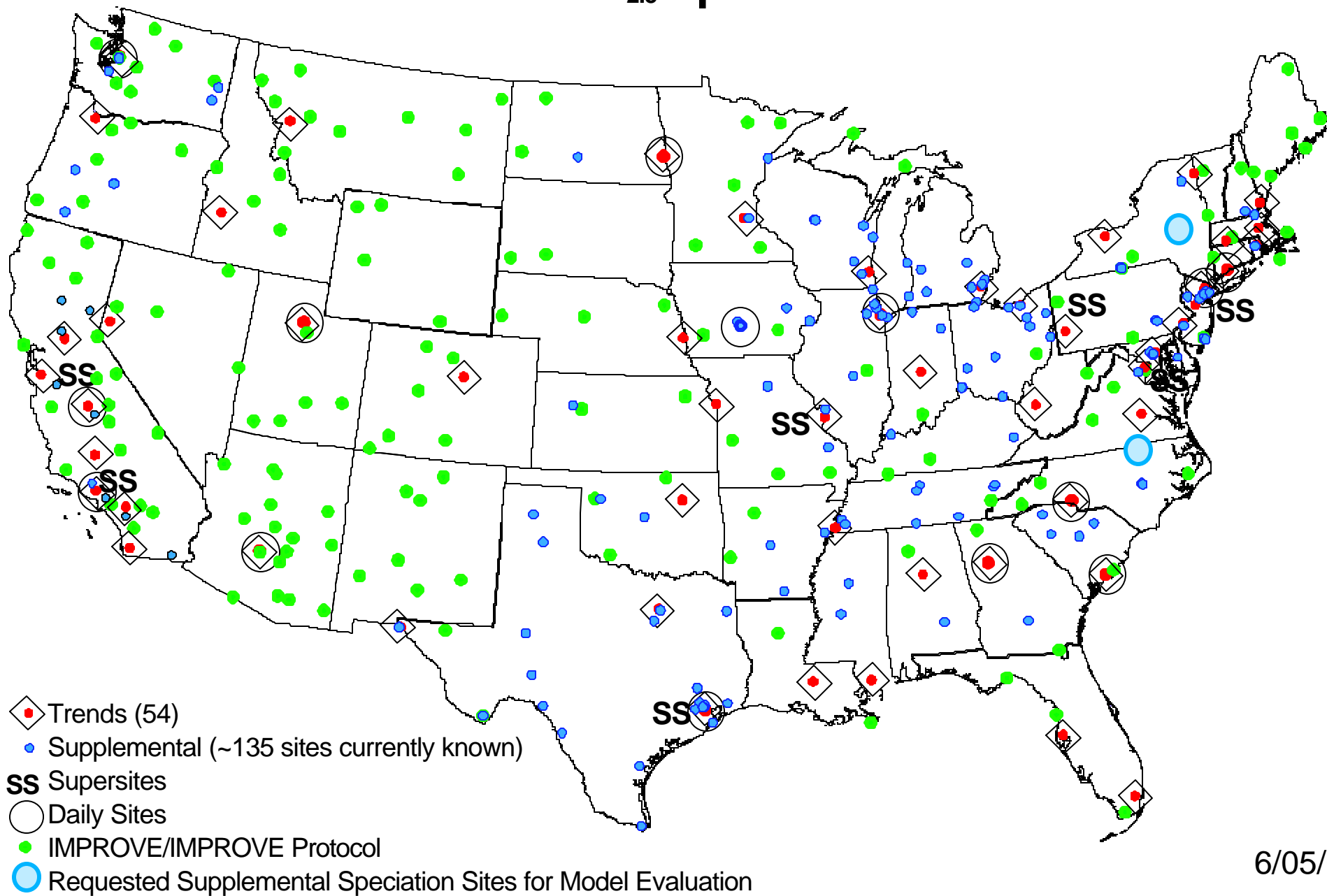
A few site locations are estimated.



- IMPROVE or IMPROVE Protocol sites
- IMPROVE Protocol Sites approved since 01/01
- ▲ Castnet sites converted to IMPROVE
- Supplemental Speciation Sites
- Class I Areas
- Tribal Lands
- Requested Supplemental Speciation Sites for Model Evaluation

5/23/01

**Figure 3. Current/Planned
Urban & Rural PM_{2.5} Speciation Networks**



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Table 1. Chemical Speciation Network - Based Upon Current Funding Plans

14-Jun-01

State/Tribe	IMPROVE Class 1 Area Sites	Tribal IMPROVE Protocol Sites	State IMPROVE Protocol Sites	Daily Speciation	Trends + Add'l 1in3 Sites	Supplemental Sites 1 in 6
CT	0	0	1	1	2	0
ME	2	0	2	0	0	0
MA	0	0	2	0	3	0
Micmac	0	1	0	0	0	0
NH	1	0	0	0	2	0
Penobscot	0	1	0	0	0	0
RI	0	0	0	0	2	0
VT	1	0	1	0	1	0
Wampanoags	0	1	0	0	0	0
Region I	4	3	6	1	10	0
NJ	1	0	0	0	1	11
NY	0	0	1	1	2	14
PR	0	0	0	0	1	4
VI	1	0	0	0	0	0
Region II	2	0	1	1	4	29
DE	0	0	0	0	0	2
DC	0	0	0	0	1	1
MD	0	0	0	0	1	4
PA	0	0	0	0	2	12
VA	2	0	0	0	1	3
WV	1	0	0	0	1	4
Region III	3	0	0	0	6	26
AL	1	0	0	0	1	7
FL	3	0	0	0	2	2
GA	2	0	0	1	1	7
KY	1	0	0	0	0	10
MS	0	0	0	0	1	4
NC	3	0	0	1	1	7
SC	1	0	0	1	1	3
TN	1	0	0	0	1	8
Region IV	12	0	0	3	8	48
IL	0	0	0	1	1	6
IN	0	0	0	0	1	6
MI	2	0	0	0	1	8
MN	2	0	2	0	1	2
OH	0	0	0	0	1	12
WI	0	0	0	0	1	4
Region V	4	0	2	1	6	38
AR	2	0	0	0	0	3
Cherokee	0	1	0	0	0	0
LA	1	0	0	0	1	1
NM	7	0	0	0	0	0
OK	1	0	1	0	1	2
TX	2	0	1	1	3	21
Region VI	13	1	2	1	5	27
IA	0	0	2	1	1	2
KS	0	0	2	0	1	1
MO	2	0	1	0	2	3
NE	0	0	3	0	1	0
Omaha	0	1	0	0	0	0
Sac and Fox	0	1	0	0	0	0
Region VII	2	2	8	1	5	6
CO	6	0	0	0	1	4
Fort Peck	0	1	0	0	0	0
MT	7	0	0	0	1	1
ND	2	0	0	1	1	2
Northern Cheyenne	0	1	0	0	0	0
Salish and Kootenai	0	1	0	0	0	0
SD	2	0	0	0	0	1
UT	4	0	0	1	1	2
WY	3	0	0	0	0	0
Region VIII	24	3	0	2	4	10
AZ	9	0	4	1	1	1
CA	17	0	0	14	7	10
HI	2	0	0	0	0	1
NV	1	0	2	0	1	0
Region IX	29	0	6	15	9	12
AK	3	0	0	0	1	0
ID	3	0	0	0	2	0
OR	5	0	0	0	1	3
Spokane	0	1	0	0	0	0
WA	6	0	1	1	1	4
Region X	17	1	1	1	5	7
Totals	110	10	26	26	62	203