

New York's plan to enhance the pilot monitoring project to inform the next review of the secondary standards for oxides of nitrogen and sulfur

NADP Fall Meeting

Portland, ME

October 2-4, 2012

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NY has established regulations to address Acid Deposition

- State SO₂ Air Quality Objective: 1964
 - Primary 0.1 ppm (24-Hr) and 0.25 ppm (1-Hr)
- State Acid Deposition Control Act (SADCA): 1984
 - set a Environmental Threshold Value (ETV) for sulfate deposition: 20 kg/ha
- National SO₂ NAAQS established: 1971
 - Primary 0.03 ppm Annual and 0.14 ppm (1-Hr)
 - Secondary 0.5 (3-Hr) (Revoked in 1973)

NYS Acid Deposition Monitoring Program Objectives

- Provide a consistent, quality-assured, long-term acid deposition database.
- Measure acid deposition in sensitive receptor areas.
- Measure acid deposition in urban and upwind areas.
(Architecture/Monument degradation was an important acid rain issue in the 1970 - 1980s)
- Data used to:
 - Perform spatial and temporal analyses of acid deposition, its precursors, and its effects.
 - Provide accountability for policy decisions.

NYS Acid Deposition related Water Quality Monitoring

- Adirondack Lake Survey (ALS) - synoptic survey of 1493 lakes (1984-1987)
- ALSC: current routine surface water monitoring programs
 - Adirondack Long-Term Monitoring (ALTM) - monthly sampling of 52 lakes
 - Temporally Integrated Monitoring of Ecosystems (TIME) - annual sampling of 43 lakes, 1991-present
 - Seasonal cloud sampling at Whiteface Mt
 - Snowpack chemistry (1999-present)
 - Additional weekly sampling during spring snowmelt since 1993
- Streams
 - WASS 200 streams (2003-05),
 - ECASS 200 streams (2010-11),
 - 3 routine streams in the ADKs
- Various fish other aquatic biota surveys
- Ad Hoc soil sampling / re-sampling
- Others

NYS Acid Deposition Monitoring

- NYS Acid Deposition Network – 16 Sites
- NYS SO₂ monitoring – 23 Sites
- NTN – 11 Sites
- AMoN – 2 Sites
- AirMoN – 1 Site
- CastNet – 2 Sites
- Other AQ monitoring

NYS Assessment of Long-Term Monitoring for S, N and Hg

SUNY Environmental Science and Forestry with support from a Project Advisory Committee (PAC):

- Gathered and synthesized long-term monitoring program information and metadata;
- Undertook statistical analysis of select datasets to identify monitoring options and affects on understanding patterns and trends;
- Held a workshop and other meetings to collect and disseminate information about the project, and:
- Developing a final report describing the project process and findings.

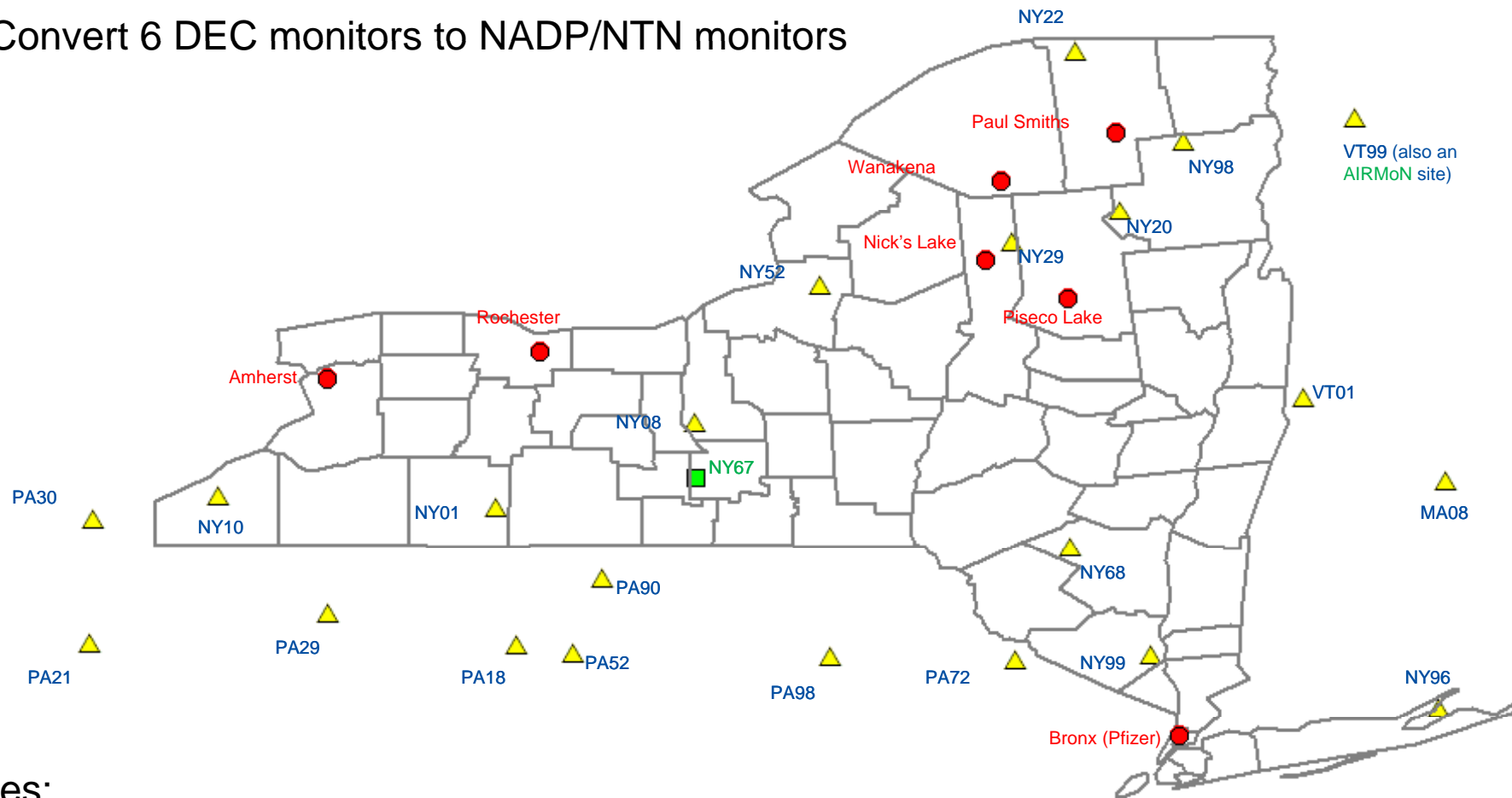
NYSERDA is working with interested cooperators, governmental entities, academia, researchers and stakeholders to develop an efficient and effective long-term monitoring program which addresses the key science and policy questions.

EPA “Pilot” Monitoring Objectives

- Evaluate measurement methods for the ambient air indicators of NO_y and SO_x and consider designation as FRMs
- Examine the variability and improve characterization of concentration and deposition patterns of NO_y and SO_x
- Develop updated ecoregion specific factors (i.e., F1 through F4) for the AAI equation based in part on new observed air quality data (relate air concentrations to water chemistry)
- Calculate ecoregion specific AAI values and compare to a set of alternative AAI-based standards
- Develop air monitoring network design criteria
- Assess the use of total nitrate measurements as a potential alternative indicator for NO_y
- Evaluate modeled dry deposition algorithms
- Facilitate stakeholder engagement in addressing implementation issues

Proposed changes to NYSDEC Acid Deposition monitoring network

- Close 10 DEC sites: Westfield, Elmira, Belleayre Mountain, Mount Ninham, Grafton, Whiteface Mountain (existing NTN), East Syracuse, Eisenhower Park, Nick's Lake (only deposition), Camp Georgetown (no power currently)
- Convert 6 DEC monitors to NADP/NTN monitors



Notes:

- Whiteface Mountain: explore seasonal wet deposition at summit
- Nick's Lake and Whiteface will have CASTNET filter pack, AMon and continuous SO₂
- Moss Lake site (NY29) is a NADP NTN site
- Move Niagara Falls to Amherst

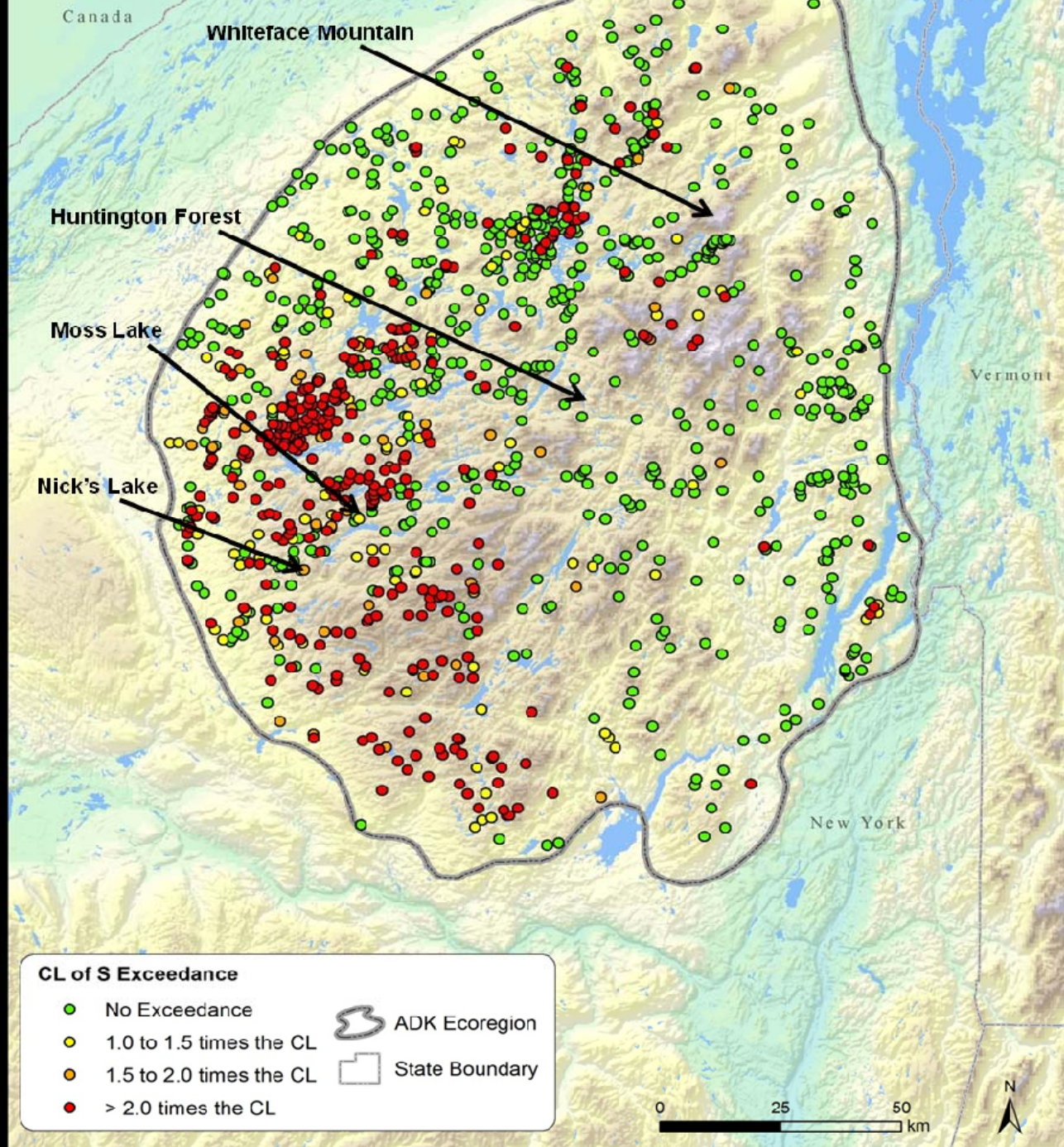
Monitoring to Support the EPA Pilot Program

- The EPA plans to use one central site (Huntington Forest) to represent the Adirondack Region
 - Logical choice based on the level of instrumentation and length of the data record
 - The site is not near heavily impacted lakes, does not represent the range of values expected over the aerial extent of the Adirondack Park
- Ideally the data collected in the Pilot should be representative of areas with lakes that have a broad range of acid buffering capacity so the range of AAI standards can be evaluated
- There are insufficient comparisons between CFP data and other FRM/FEM/other methods: cont SO₂, cont Sulfate, CSN: Sulfate, Nitrate, Ammonium and NO_y

Planned changes to NYSDEC monitoring program: (5 Year commitment)

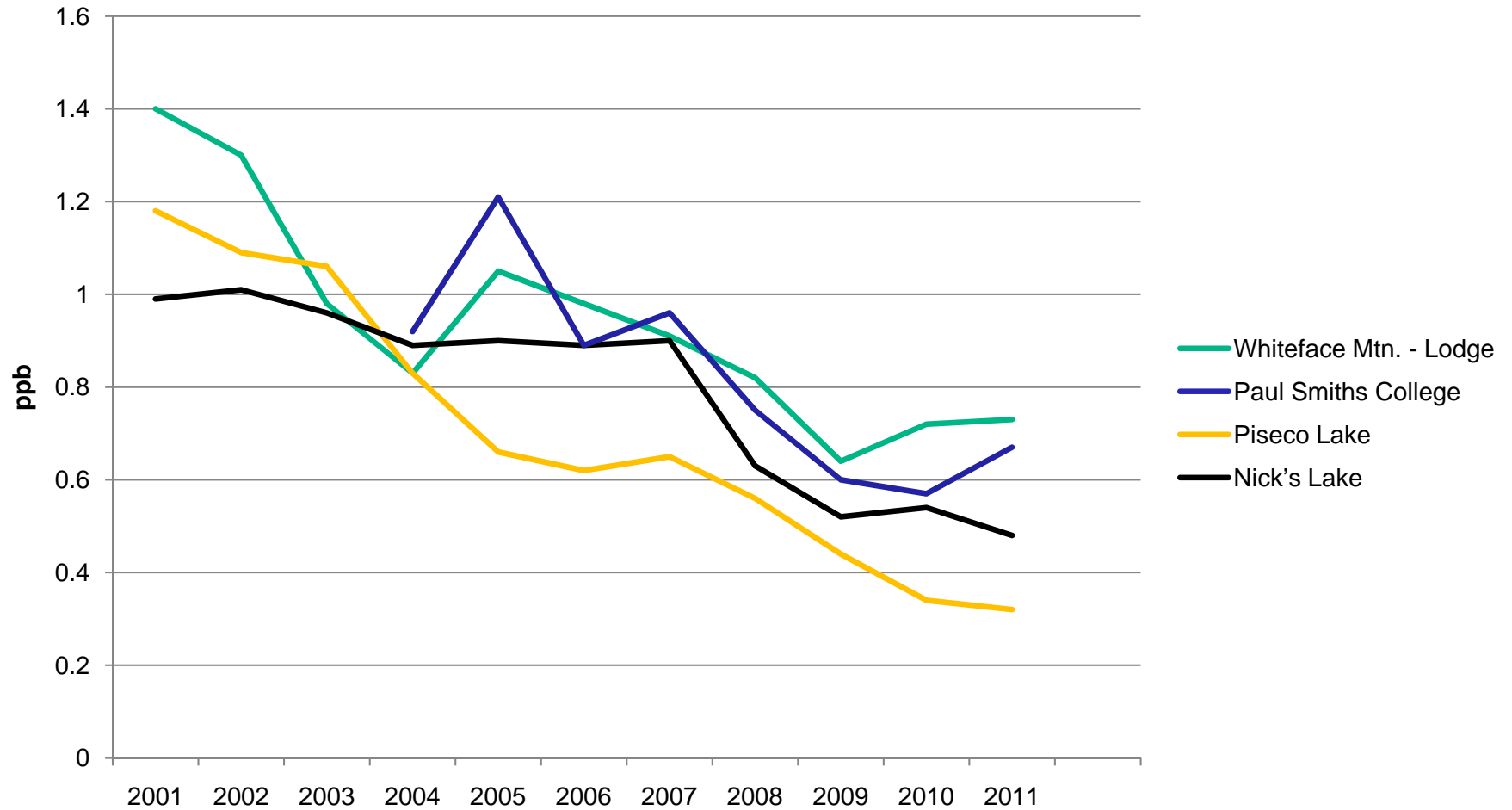
- Convert 6 NYSDEC sites to NADP NTN program to provide consistent statewide data for use in pilot analyses
 - Close redundant NYSDEC sites (near existing NADP sites)
- Add CFP and AMon to 2 sites to add spatial representation to pilot
- Support SO₂, CSN and cont Sulfate at Whiteface Base
- Support SUNYA-ASRC NO_x & CO at Whiteface Base and NO_y at summit
- Support enhanced water body and stream monitoring
 - ANC and watershed data necessary for pilot data analyses

ALSC Sampled Watersheds
ANC Criterion = 50 $\mu\text{eq/L}$ in 2100



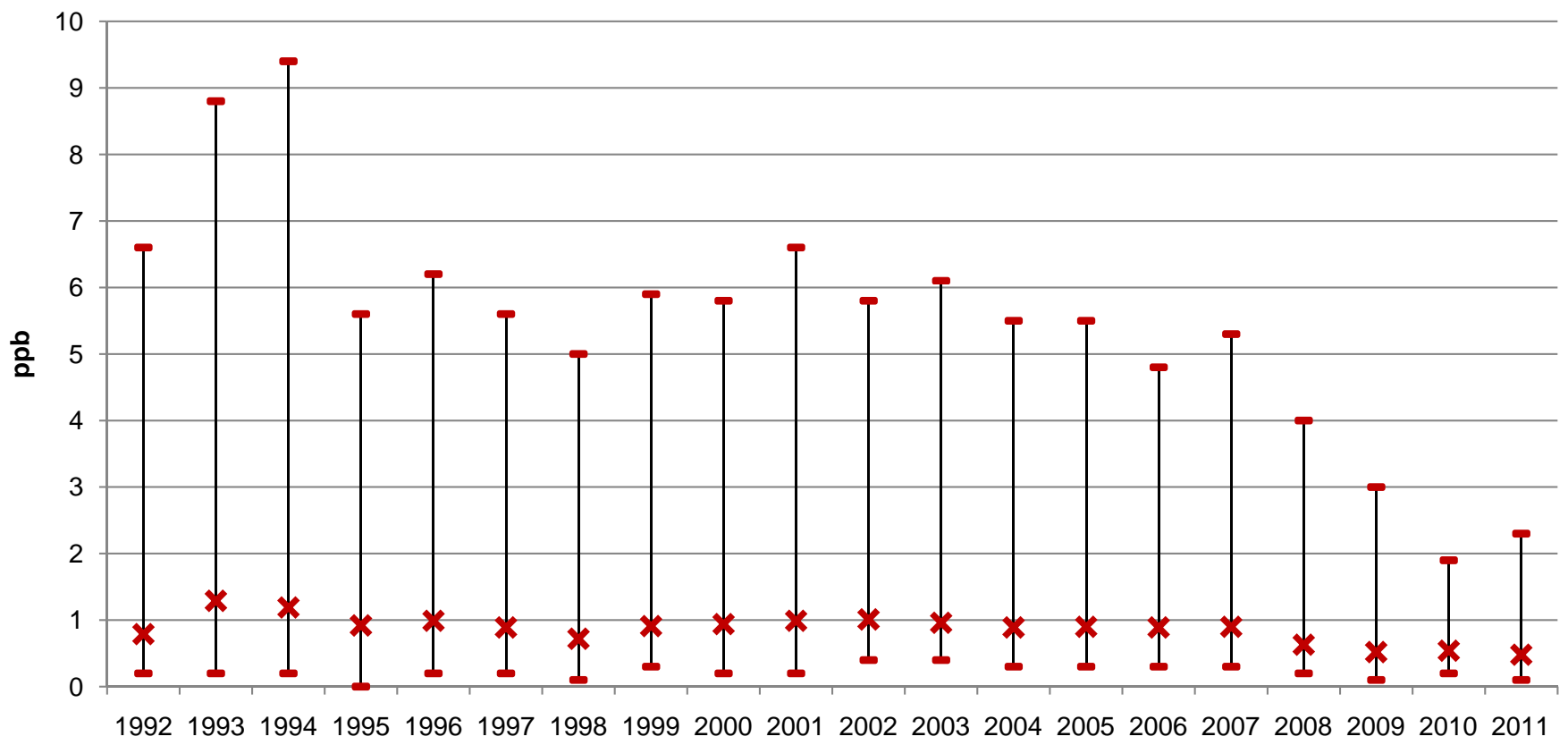
SO₂: Air Quality Indicator

Annual Average SO₂ in Adirondack Region



1-Hr FRM: Typical SO₂ Data Range in the Adirondacks

Nick's Lake Annual SO₂ Averages with 90th and 10th Percentiles



A majority of the SO₂ data are now below 1 ppb

SO₂ FRM: Marginal low level Performance

TEI Model 43C Specifications:

Lower Detectable Limit:
1.0 ppb (60 sec ave time),
0.5 ppb (300 sec ave time)

Zero Drift (24 hour): < 1 ppb

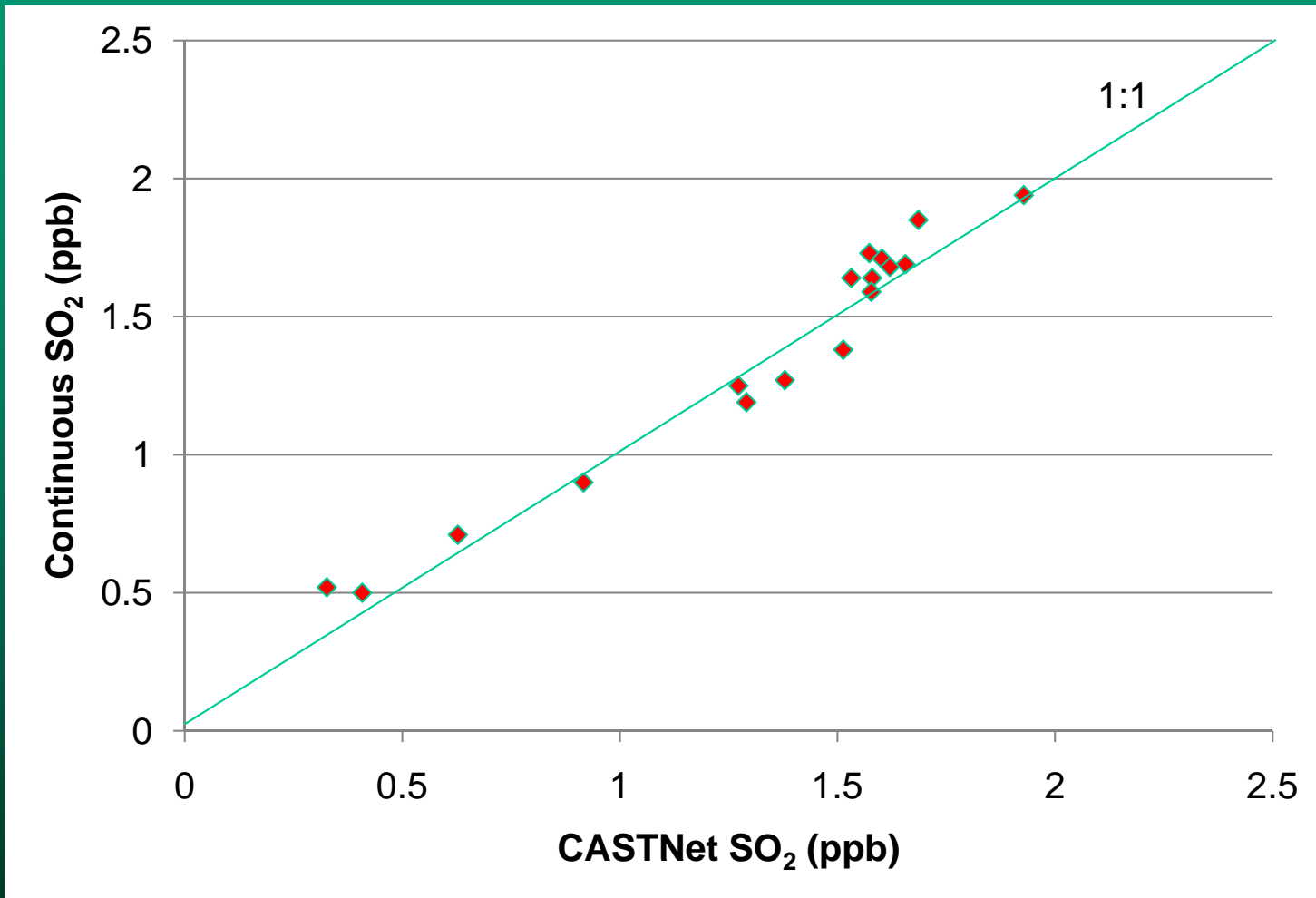
Span Drift (24 hour): ± 1% / wk

- Routinely Monitoring SO₂ levels below 1.0 ppb requires frequent site visits to adjust for instrument zero drift
- Calibration accuracy is more difficult at low levels

Thermo Scientific Model 43i-TLE Enhanced Trace Level SO₂ Analyzer

Preset Ranges	0-10, 20, 50, 100, 200, 500 and 1000 ppb; 0-20, 50, 100, 200, 500, 1000 and 2000 µg/m ³
Custom Ranges	0-10 to 1000 ppb; 0-20 to 2000 µg/m ³
Zero Noise	0.025 ppb RMS (300 second averaging time)
Lower Detectable Limit	0.05 ppb (300 second averaging time)
Zero Drift	< 0.2 ppb per day
Span Drift	+/-1% of full scale
Response Time	80 seconds (10 second average time)
Precision	1% of reading or 0.2 ppb (whichever is greater)
Linearity	+/-1% of full scale

Continuous SO₂ and CFP SO₂ Comparison

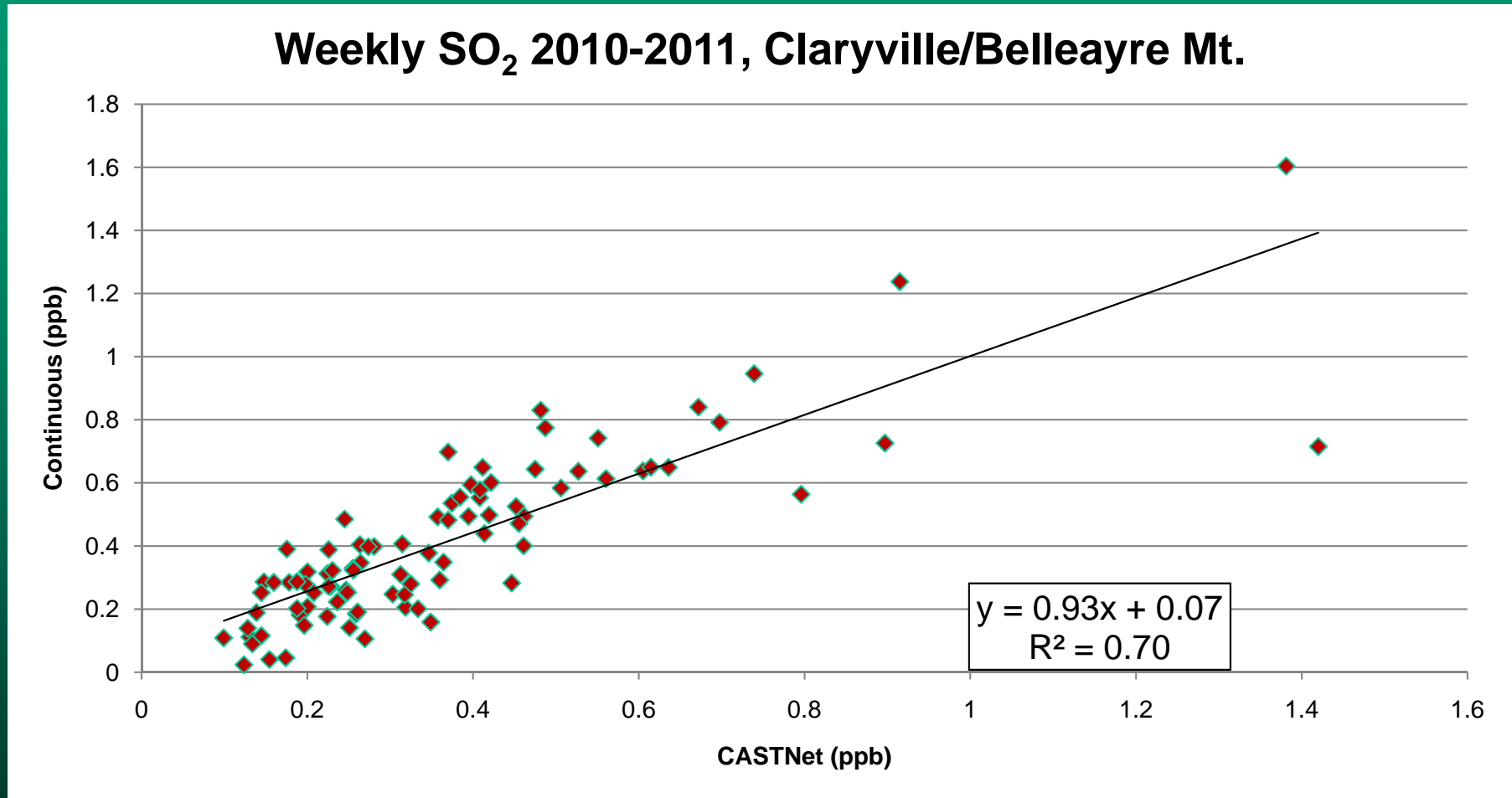


Annual comparisons are encouraging

Annual average SO₂ at Belleayre Mountain (NYSDEC continuous) and Claryville (CASTNet integrated), 1995-2011.

The monitors are ~14 mi apart in the Catskill Mountains, NY

Continuous SO₂ and CFP SO₂ Comparison

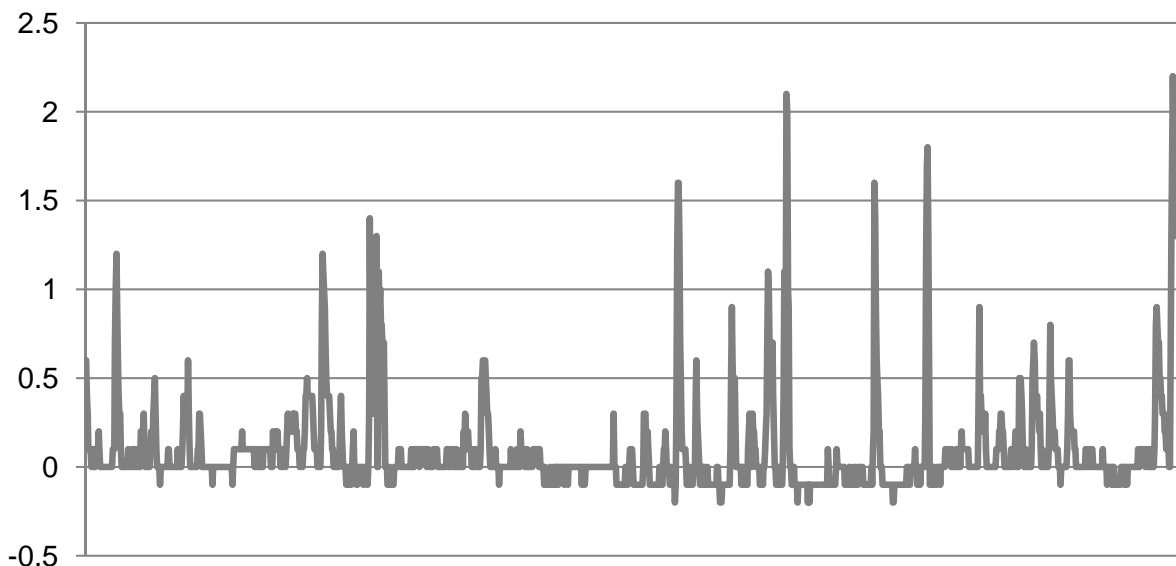


Weekly comparisons are not as encouraging
and have a seasonal bias

SO₂: Which Averaging Interval?

- Ambient SO₂ varies on short time scales and this variation is lost in integrated CFP data
- Is the deposition mechanism of SO₂ linear over the concentration ranges 0.1-10 ppb?
 - Is dry deposition greater during short term peaks (1-hr) or is longer averaging period (week, season, annual) data adequate?

1-Hr SO₂ Piseco Lake July-August 2012



This information would help to determine the most appropriate SO₂ monitoring method.

Conclusions

- All sites within the State meet the original Sulfate threshold set in 1984 (20 kg/ha)
- It is imperative that the Pilot accurately represent conditions across the Adirondack Region
- Restructured deposition network to improve efficiency and support EPA Pilot (AAI)
- Use extensive water quality monitoring data to:
 - Assess accuracy of calculated AAI values
 - Assess the level of protection afforded by AAI values
- The pilot indicator and research monitoring methods will be evaluated against other methods including FRM/FEM and CSN



Carl Heilman