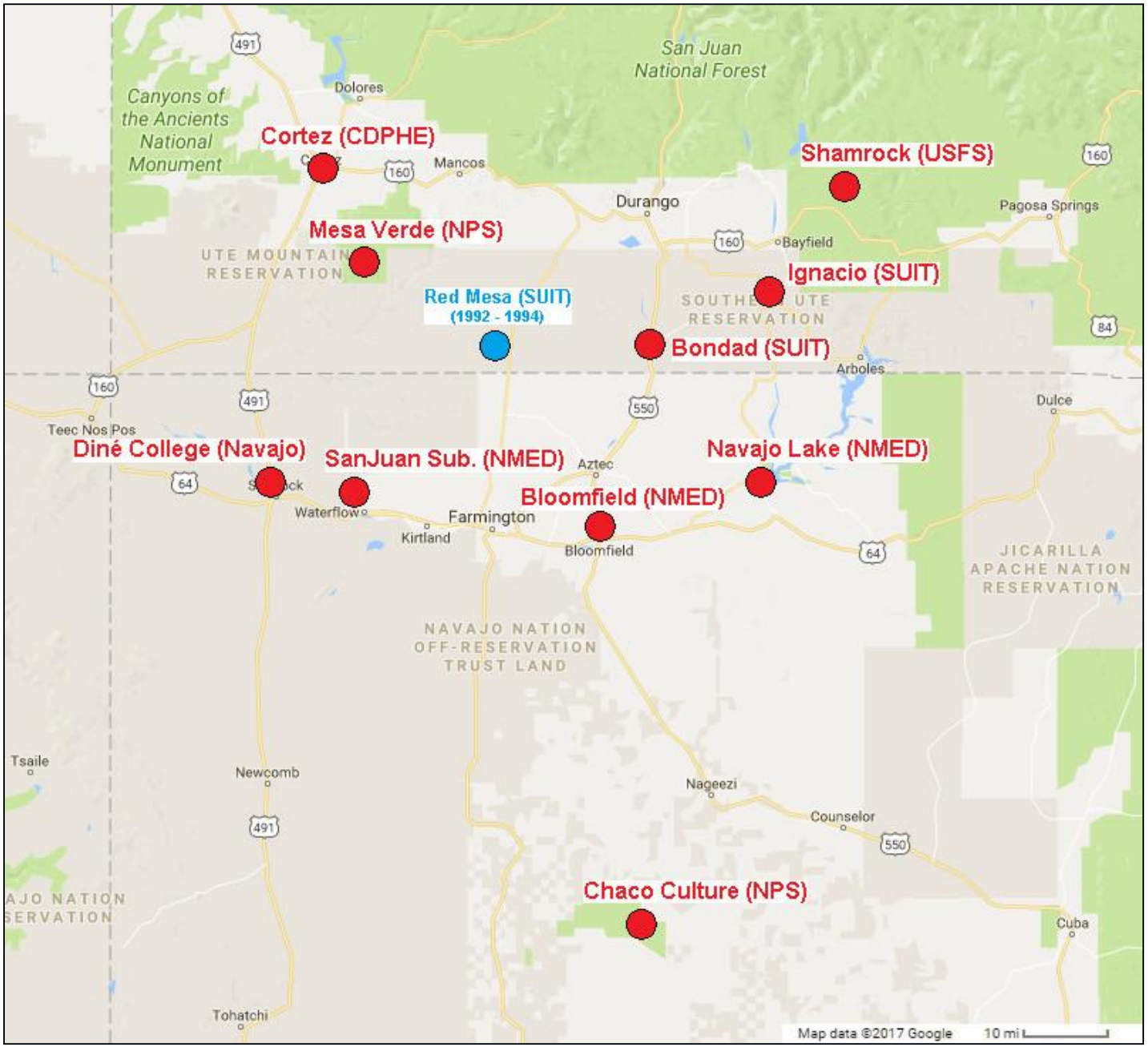
Monitoring Trends Analysis --- 2017 ---

Four Corners Air Quality Group Meeting

Durango, CO

September 13, 2017

Ozone Monitoring Sites in the Four Corners Area



Three Average 4th Maximum Ozone Values

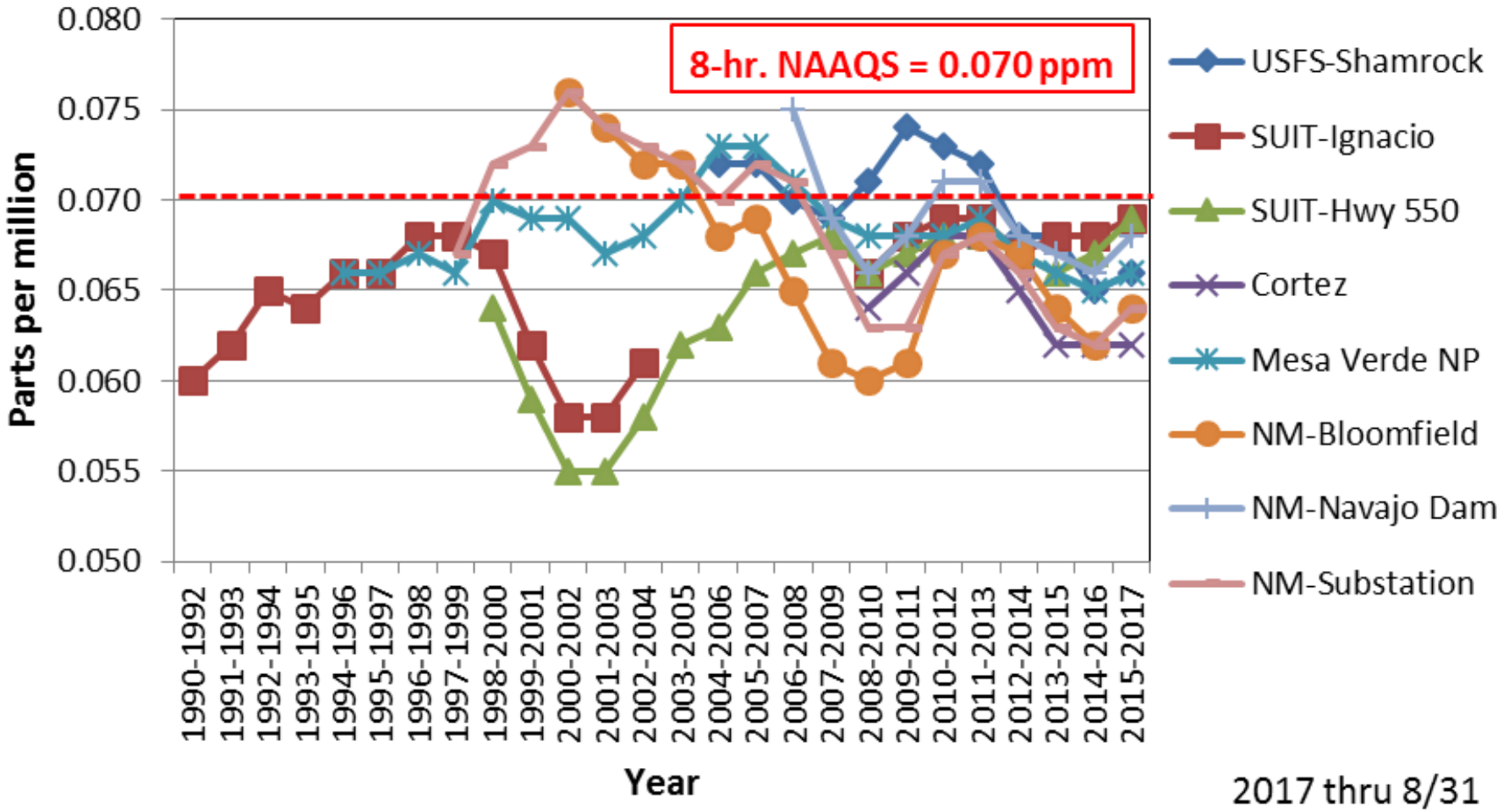
2017 data through August 31

DRAFT DATA

Site Name	AQS #	2015 8-hr O3 4th Max Value (ppm)	2016 8-hr O3 4th Max Value (ppm)	2017 8-hr O3 4th Max Value (ppm)	2015-2017 3-yr Avg 4th Max Value (ppm)	2018 Highest 4th Max to not exceed (ppm)
COLORADO						
USFS-Shamrock	08-067-1004	0.068	0.065	0.066	0.066	0.081
SUIT-Ignacio	08-067-7001	0.068	0.071	0.069	0.069	0.072
SUIT-Hwy 550	08-067-7003	0.066	0.072	0.069	0.069	0.071
CO - Cortez	08-083-0006	0.061	0.064	0.061	0.062	0.087
NPS-Mesa Verde	08-083-0101	0.066	0.066	0.066	0.066	0.080
Paradox	08-085-0005	---	0.062	0.061	---	
NEW MEXICO						
NM - Bloomfield	35-045-0009	0.061	0.065	0.068	0.064	0.079
NM - Navajo Dam	35-045-0018	0.068	0.067	0.069	0.068	0.076
NPS - Chaco Culture	35-045-0020	---	---	0.064	---	---
NM - Substation	35-045-1005	0.061	0.062	0.071	0.064	0.079
Navajo - Dine College	35-045-1233	0.066	0.064	0.060	0.063	0.088
UTAH						
NPS-Canyonlands	49-037-0101	0.065	0.064	0.065	0.064	0.083

2017 data are preliminary

8-Hour Ozone --- 3-year Avg. of 4th Max.



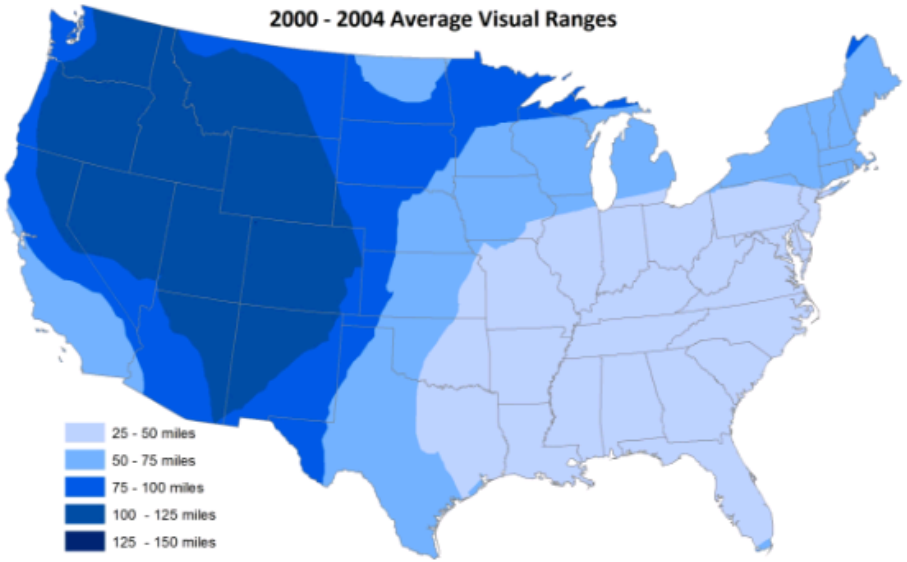
All sites below the current NAAQS

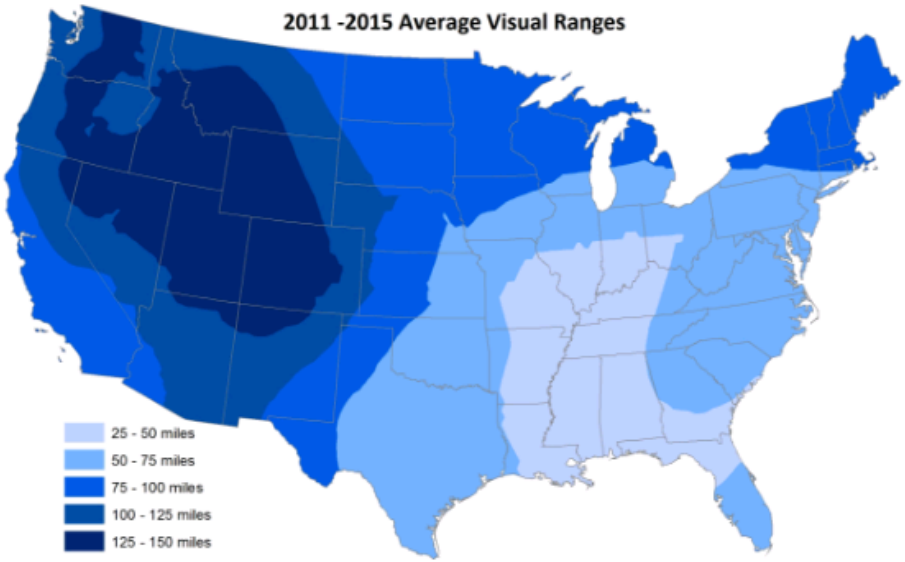
Other Air Monitoring in the Four-Corners Area (Non-Ozone)

- Particulates – CDPHE, NMED, USFS, SUIT
- Oxides of Nitrogen – NMED, USFS/BLM, SUIT, Navajo
- Sulfur Dioxide – Navajo, NMED
- Carbon Monoxide – SUIT
- Ions (nitrate, sulfate, ammonium) – NPS, USFS
- Ammonia – NMED/EPA
- Visibility – USFS, NPS, SUIT
- Mercury – USFS, NPS, NMED
- Meteorology – NMED, USFS/BLM, NPS, SUIT, Navajo
- VOC/NMOC – SUIT

Visibility

- Nephelometer data at SUIT-Bondad site
- Webcam at Mesa Verde National Park
- IMPROVE data at three regional locations
  - Mesa Verde, Shamrock Mine, Weminuche
- Significant visibility improvements at Mesa Verde and in the Weminuche Wilderness





Courtesy: EPA

Mercury

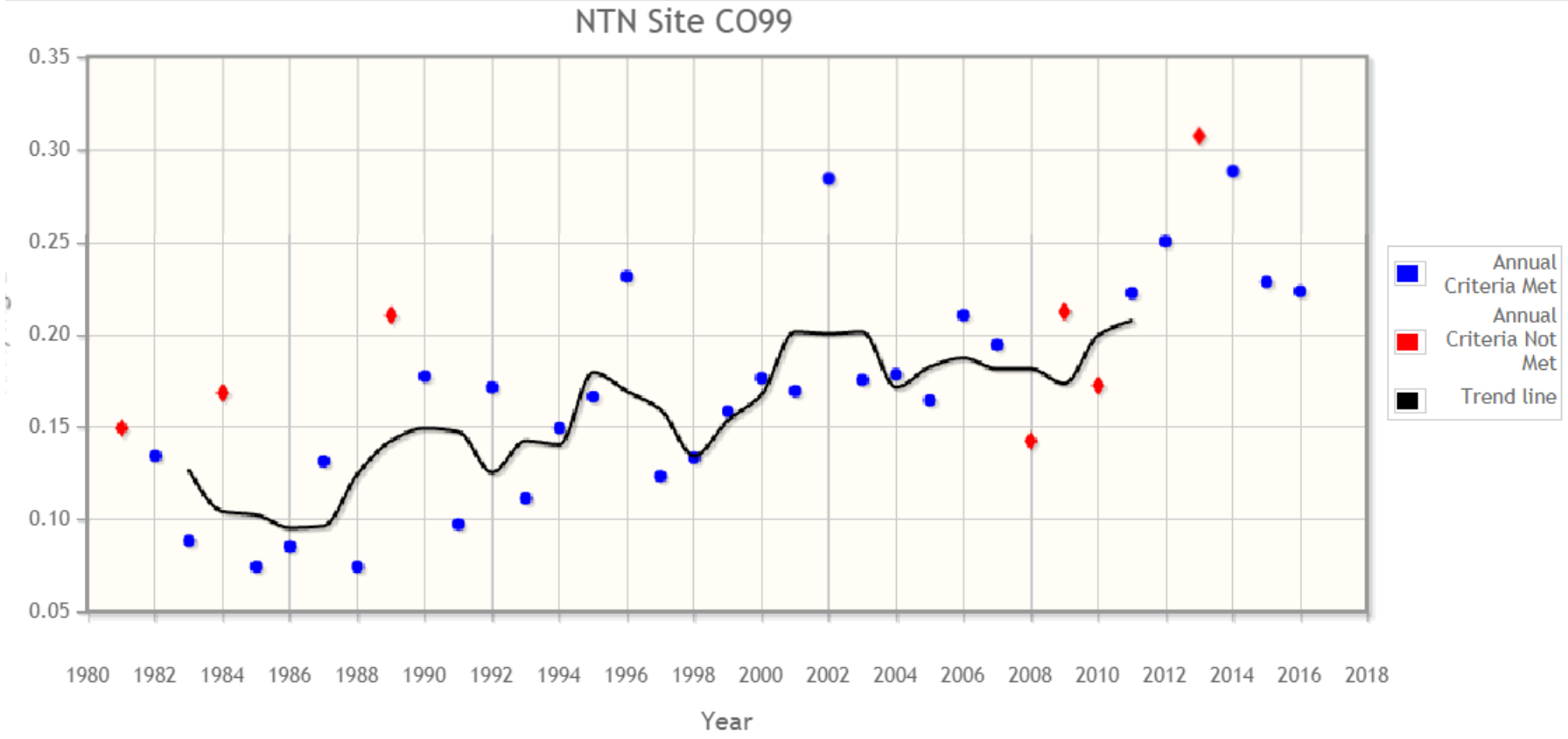
Navajo Lake Site, NM
Monitor type: Reactive Gaseous Mercury
Study duration: 2 Years; Completed

Navajo Lake Site, NM
Monitor type: Wet Deposition Mercury
Study duration: recently discontinued

Ammonia

Links to peer reviewed research articles available at http://www.nmenv.state.nm.us/aqb/4C/

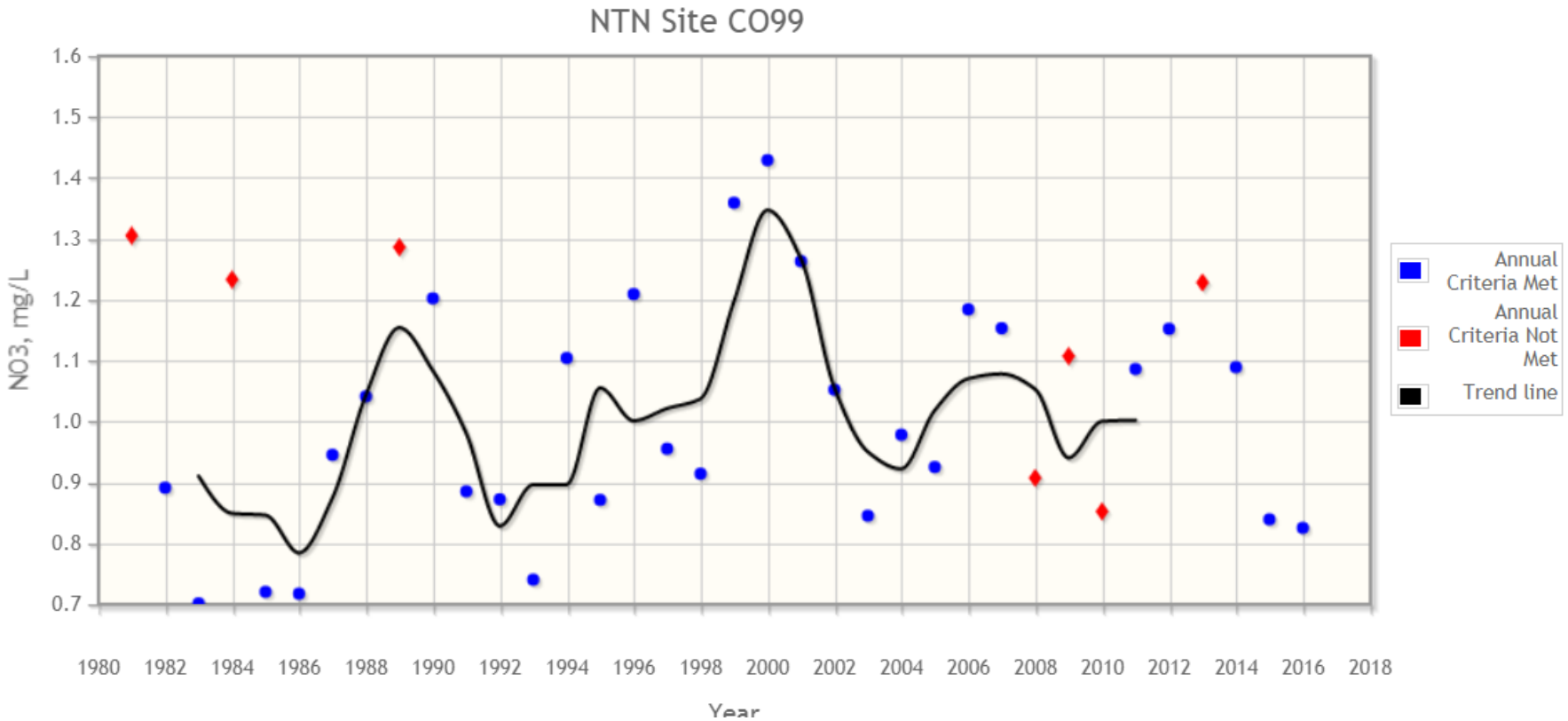
Ammonium Trends at Mesa Verde National Park



Increasing trend over time

For more on annual criteria: http://nadp.sws.uiuc.edu/documentation/completeness.asp

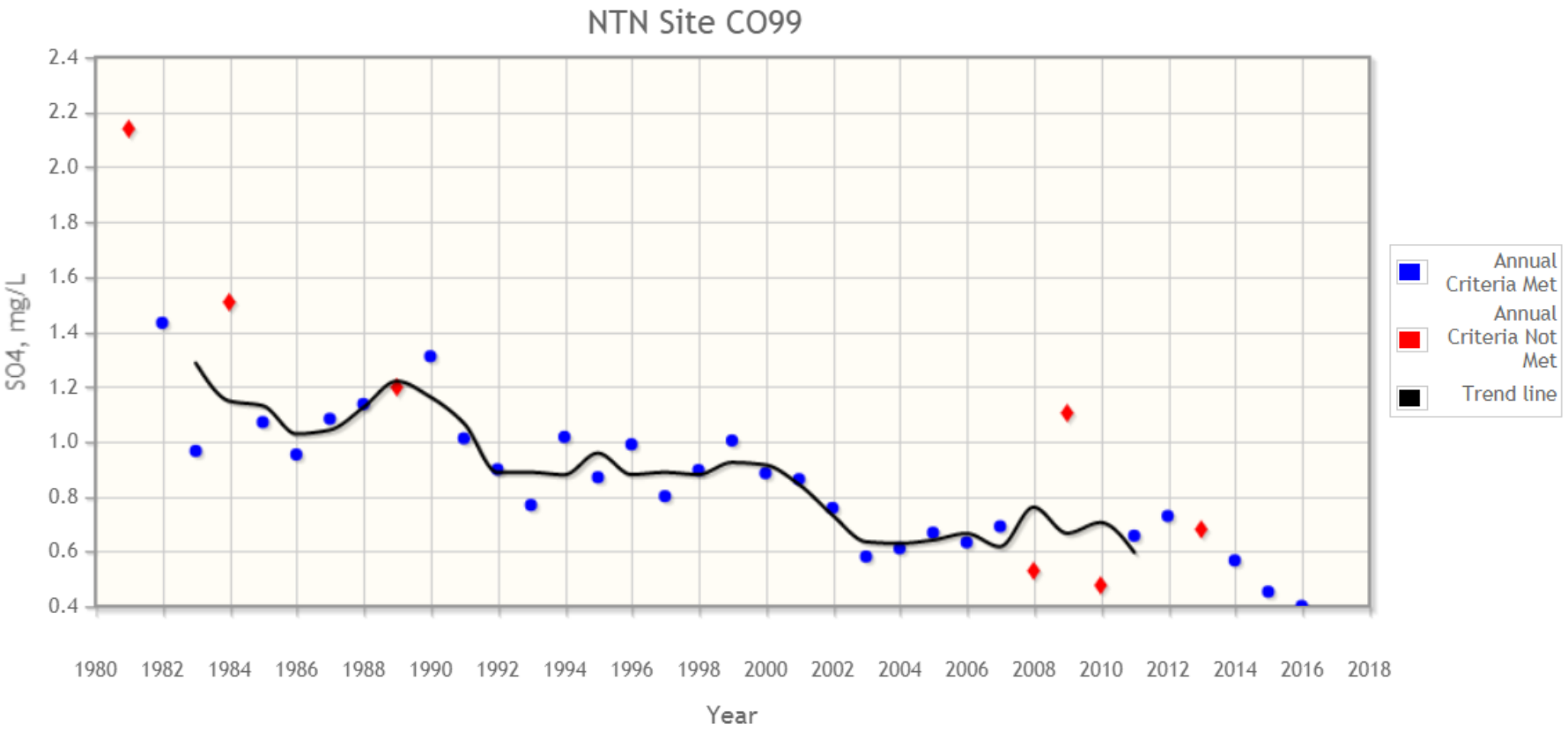
Nitrate Trends at Mesa Verde National Park



No recent trend

For more on annual criteria: http://nadp.sws.uiuc.edu/documentation/completeness.asp

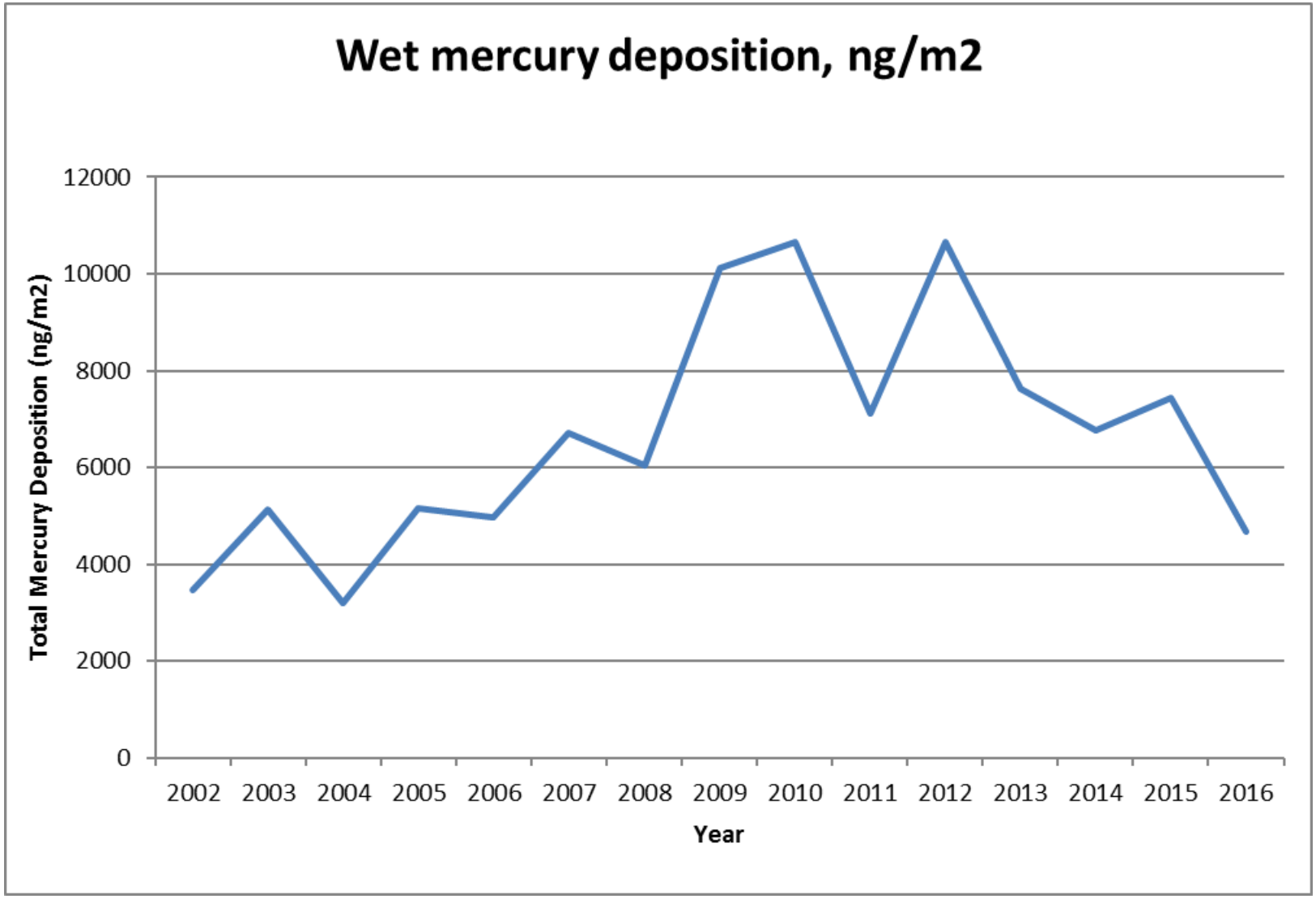
Sulfate Trends at Mesa Verde National Park



Decreasing trend over time

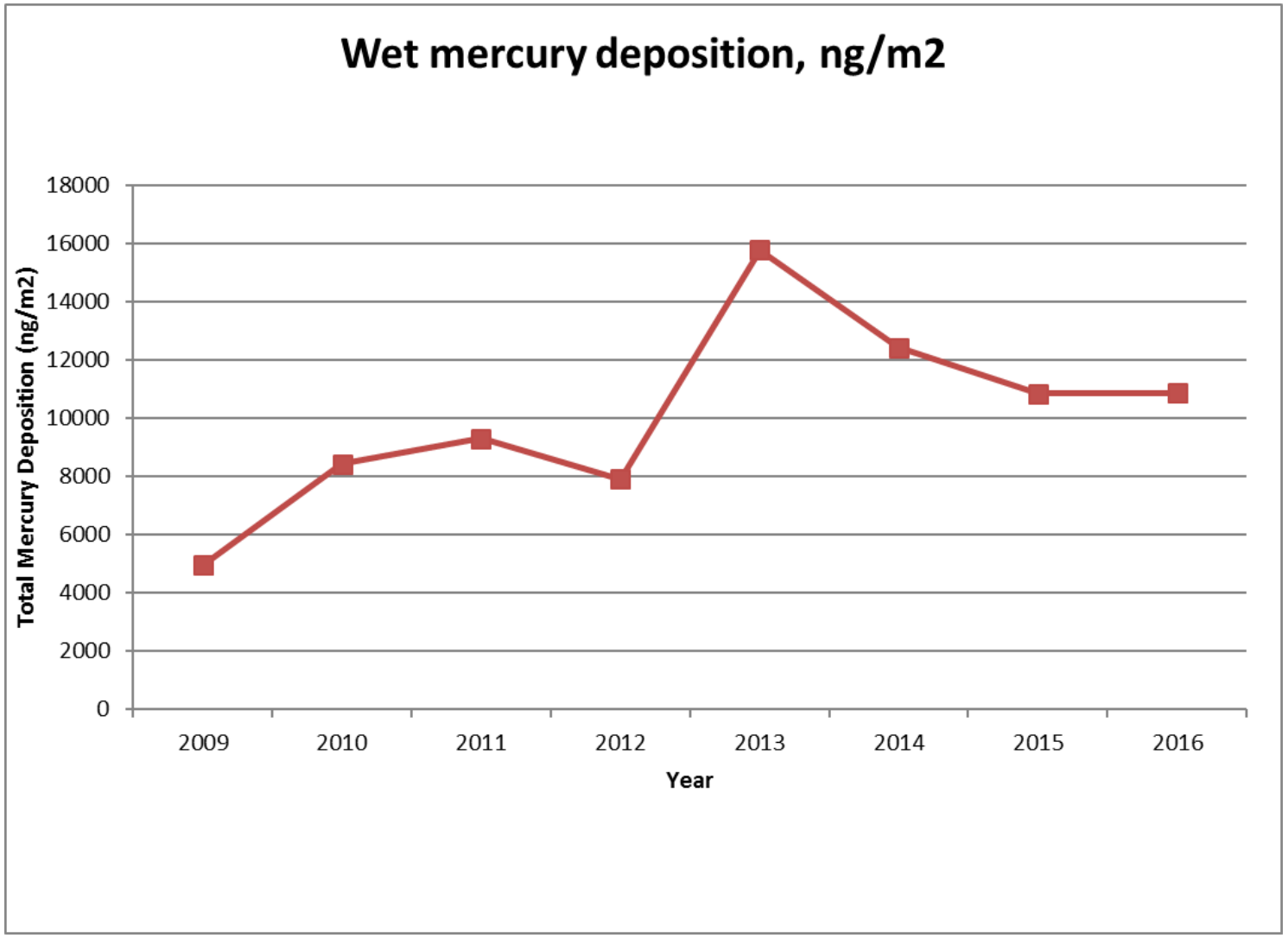
For more on annual criteria: http://nadp.sws.uiuc.edu/documentation/completeness.asp

Mercury Trends at Mesa Verde National Park



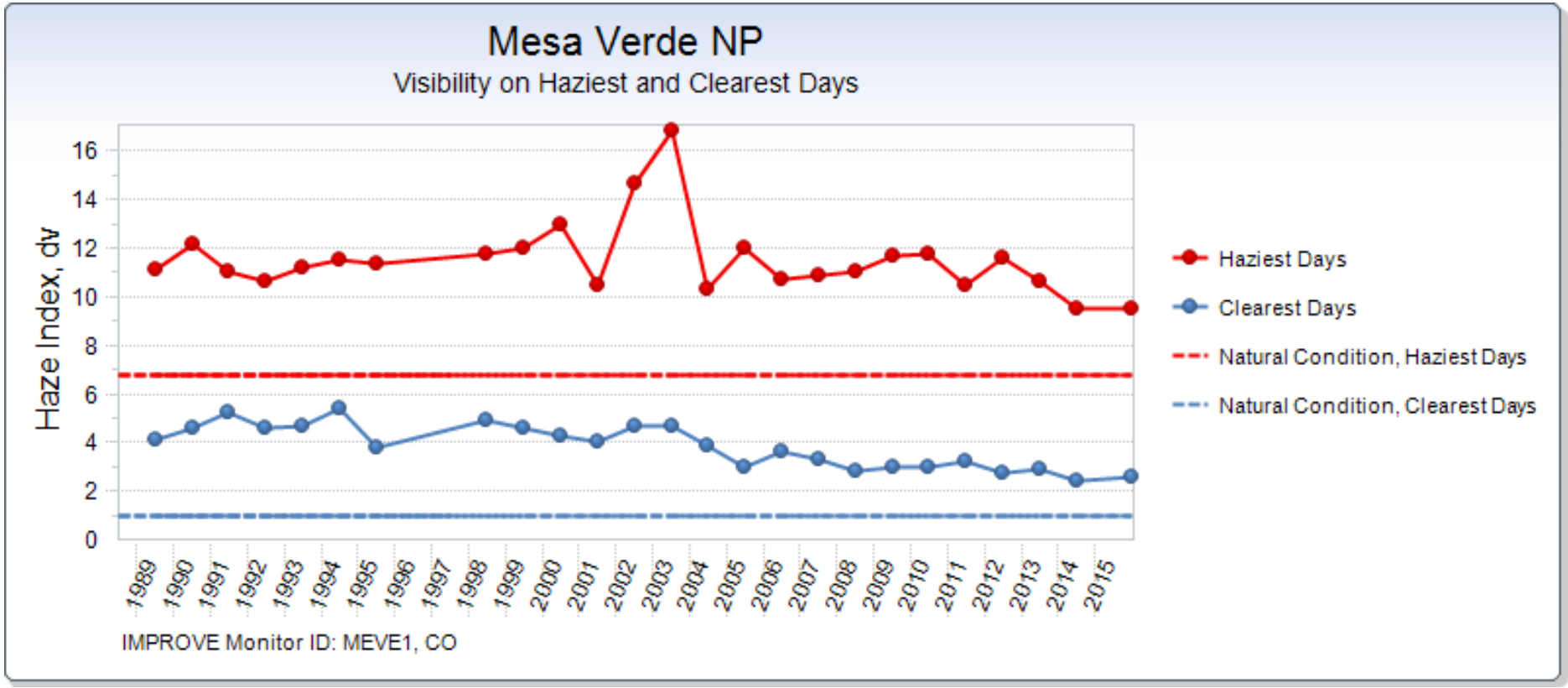
Short-term decreasing trend; long-term slight increasing trend

Mercury Trends at Molas Pass



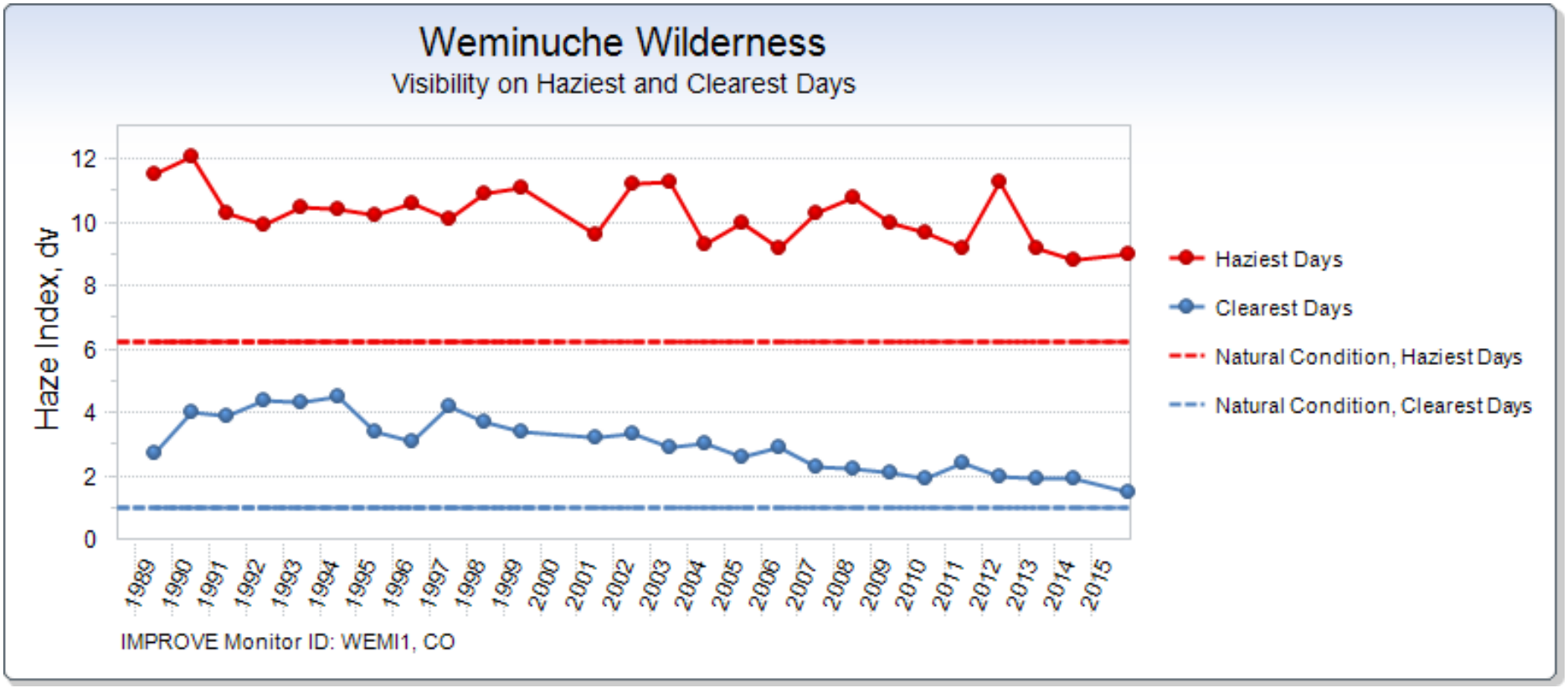
No short-term trend; long-term increasing trend

Mesa Verde National Park Visibility Range Trend



Courtesy: IMPROVE

Weminuche Wilderness Area Visibility Range Trend



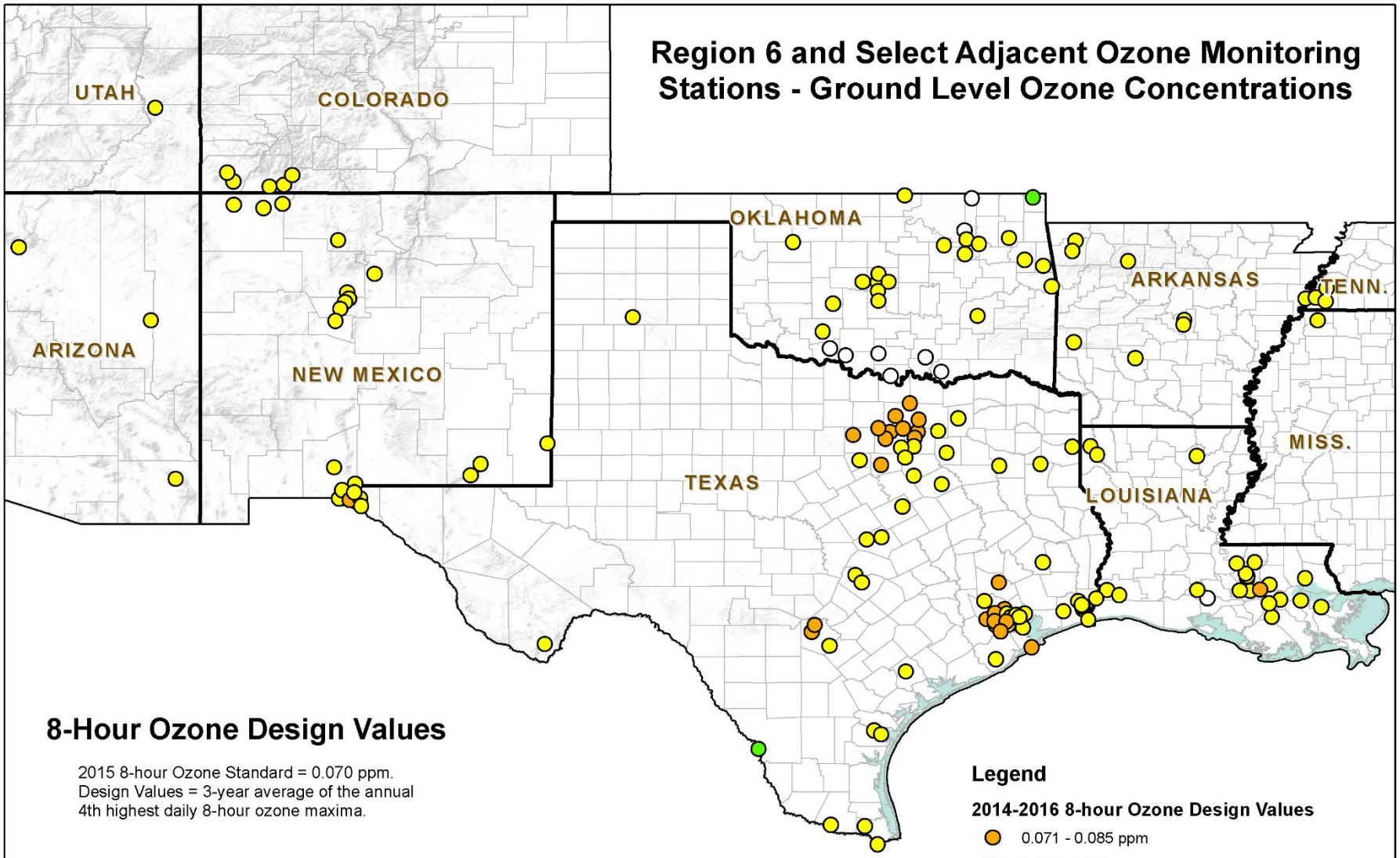
Courtesy: IMPROVE

Four Corners Area $O_3/NO_x/NH_3/SO_2$ Monitoring Trends Analysis

Mark Sather, U.S. EPA Region 6
Air Monitoring & Grants Section
Dallas, Texas

Presented at the Four Corners Air Quality Group Meeting
September 13, 2017

Region 6 and Select Adjacent Ozone Monitoring Stations - Ground Level Ozone Concentrations



8-Hour Ozone Design Values

2015 8-hour Ozone Standard = 0.070 ppm.
Design Values = 3-year average of the annual 4th highest daily 8-hour ozone maxima.

Sources: U.S. EPA AQS Database and State Agency Monitors; USGS National Atlas of the U.S.

Legend

2014-2016 8-hour Ozone Design Values

- 0.071 - 0.085 ppm
- 0.055 - 0.070 ppm
- < 0.055 ppm
- NED — Not Enough Data to compute a 3-year 8-hour ozone design value

EPA Region 6
GIS MM Division
May 16, 2017

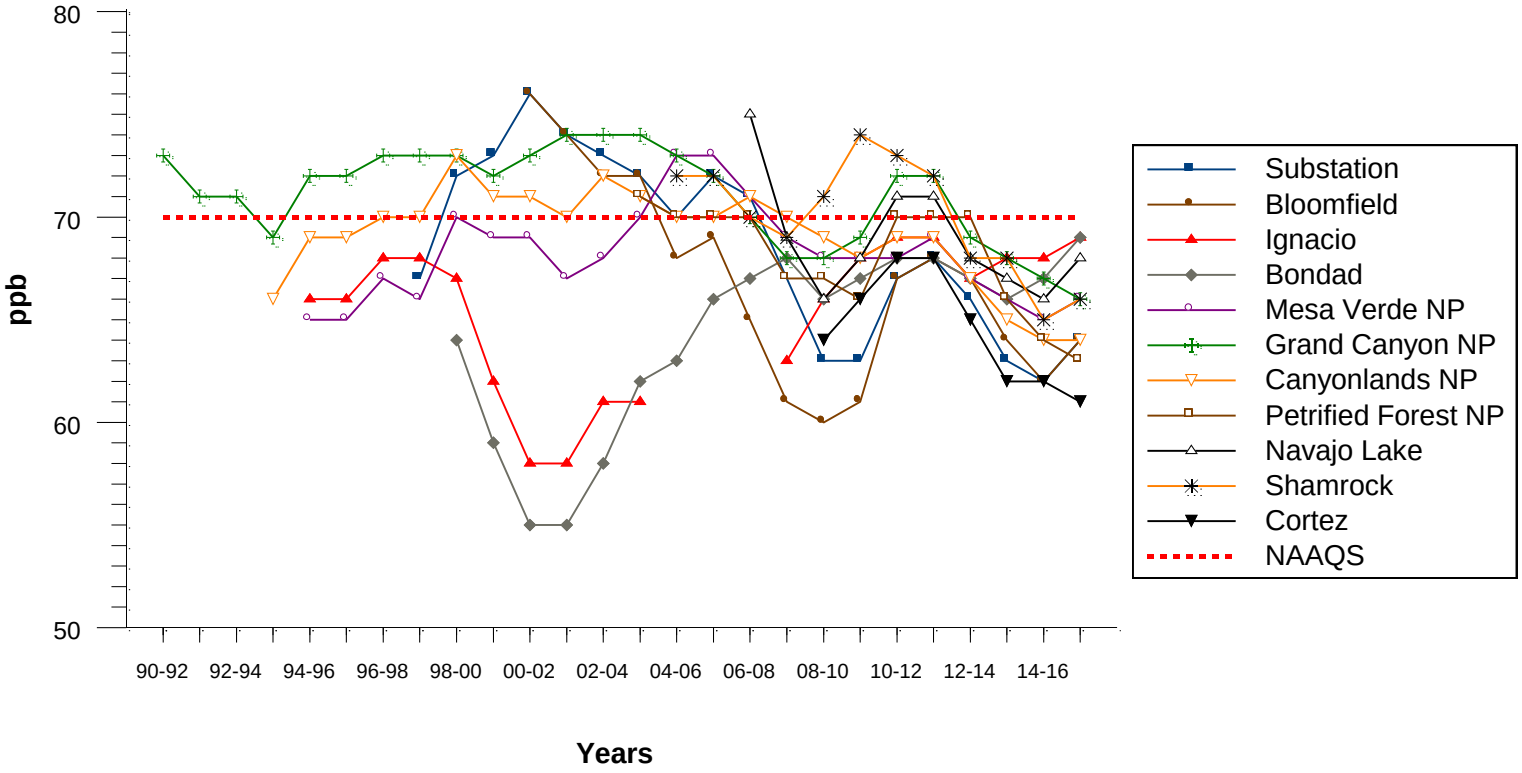
20170516DEG

N W E S

0 65 130 260 390 520 Miles

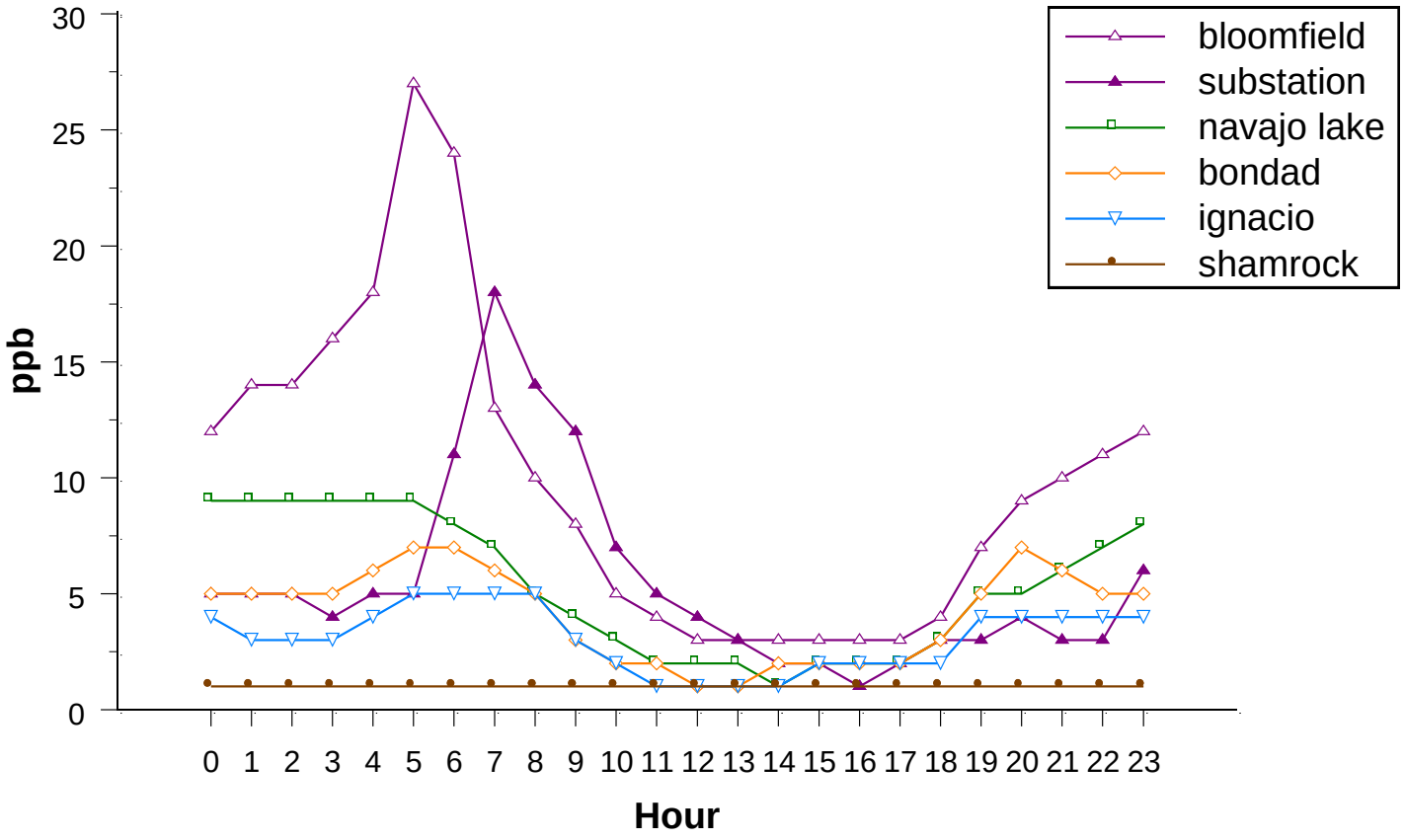
8-hour Ozone Trends

Four Corners Area; 3-year running design values

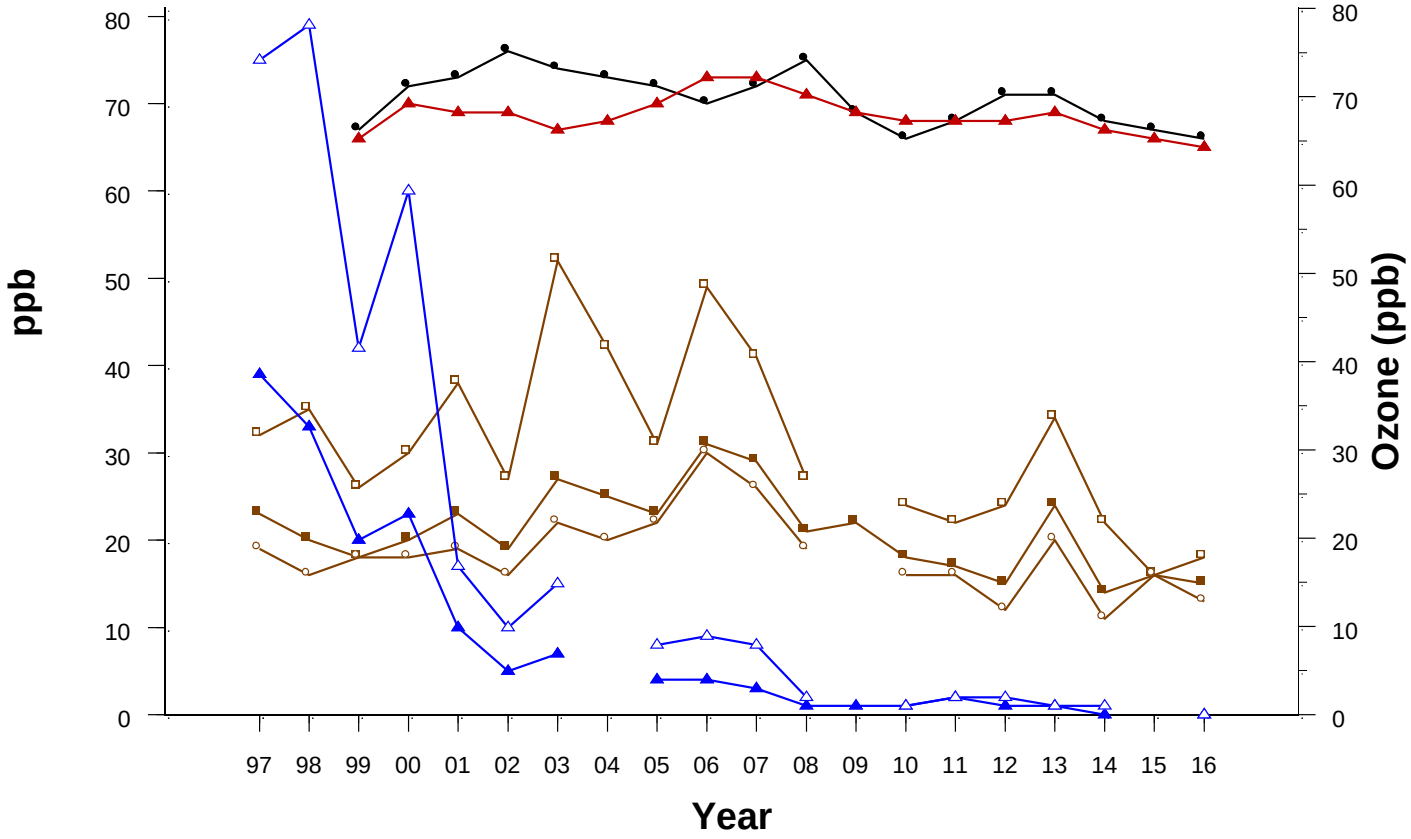


8-hour ozone design values have recently been declining in the Four Corners Area except for an uptick this year at most of the area sites.
2015-2017 values are preliminary and through 9/4/17.
2015-2017 preliminary 8-hour ozone design values range from 61 ppb at Cortez, CO to 69 ppb at Ignacio and Bondad.
Highest 8-hour ozone design value in San Juan County, NM is 68 ppb at Navajo Lake.

Four Corners NOx Diurnal Profiles; June-August, 2016



Substation Site Mean Morning NOx/SO2 Concentrations
June-August weekday 0600-0900 LST



san juan pp dominated nox and so2 uses hourly wind direction data from 70-90 compass degrees;

not enough so2 data in 2004 or 2015;

no wind direction data in 2009;

8-hour ozone design values are depicted with end year of 3-year average.

Substation Site Mean Morning NO_x/SO_2 Concentrations

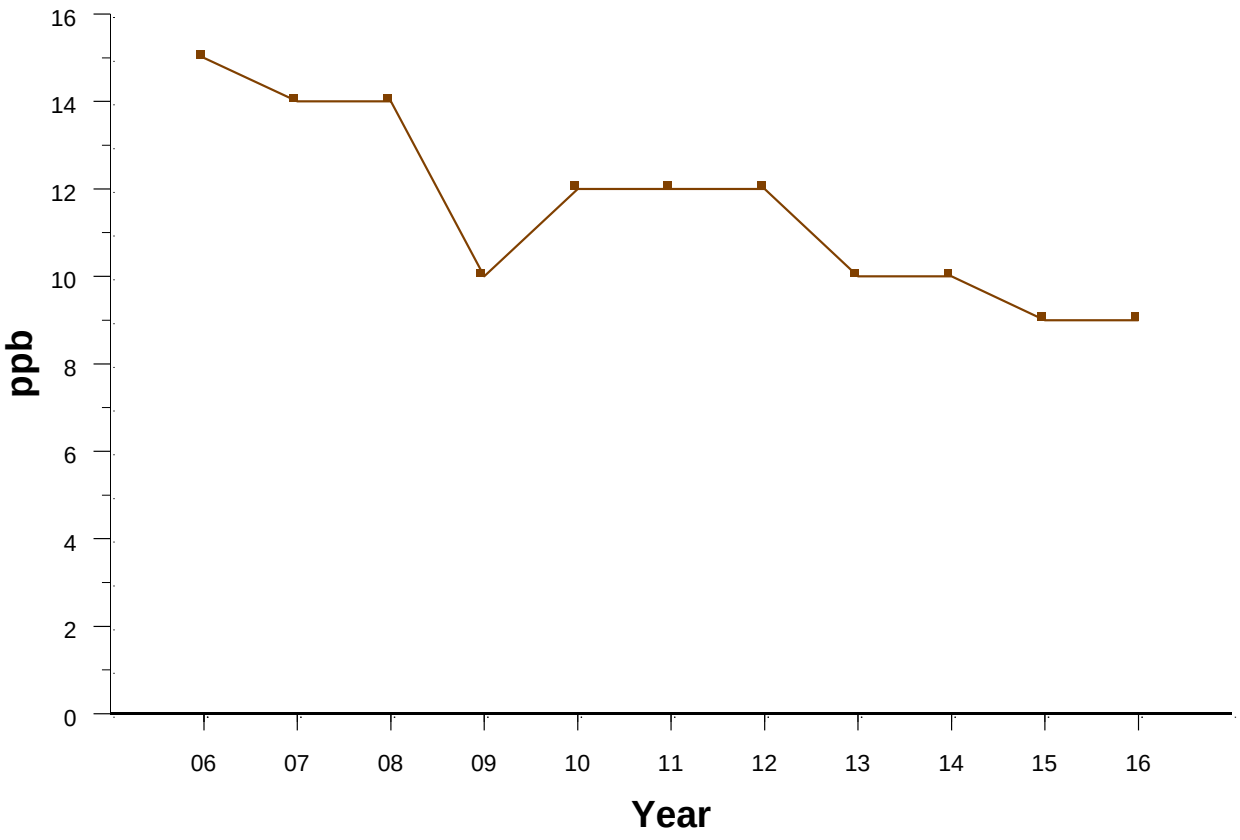
- The Substation monitoring site is about 2.5 miles west of the San Juan Power Plant, an ideal location to monitor air pollutants coming from this facility. Pollutant data gathered when the hourly wind directions are between 70 and 90 compass degrees, and when the hourly wind speeds are above 2 mph (i.e. when the wind speeds are not extremely light and variable), are used to assess concentrations that would be dominated by San Juan Power Plant emissions.

- Regarding environmental upgrades conducted at the San Juan Power Plant, the ambient NO_x and SO_2 data show a notable decline in concentrations from 2007 to 2008 (statistically significant). This ambient concentration decline took place when some low-NO_x burners were being installed and when the efficiency of the limestone SO_2 scrubbers was increased from the addition of dibasic acid to the scrubbing process. An additional decline in ambient NO_x concentrations took place between 2009 and 2012 before a significant uptick in ambient NO_x concentrations was recorded in 2013. On December 31, 2013 the Four Corners Power Plant, located about 7 miles to the south of the Substation monitoring site, permanently shut down units 1,2 and 3 (of 5 total units). This resulted in ambient NO_x emission reductions which contributed to the decrease in ambient NO_x concentrations recorded at the Substation monitoring site in 2014. Ambient NO_x concentrations recorded from the direction of the San Juan Power Plant also notably decreased from 2013 to 2014. Summer weekday morning NO_x concentrations have generally remained at similar levels from 2014-2016.

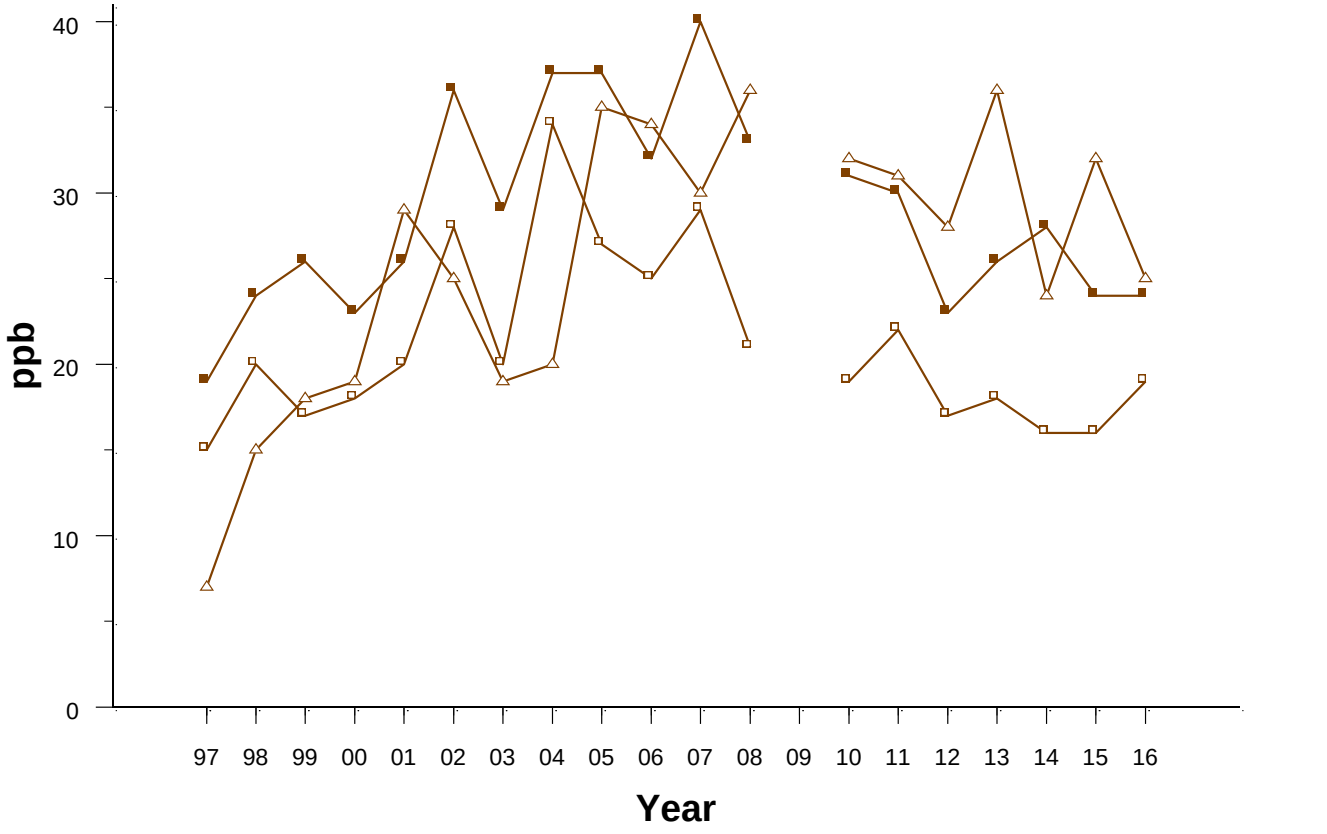
- SO_2 concentrations have dropped dramatically from the late 1990's to the present, with current summer weekday morning concentrations at practically non-detectable levels.

Navajo Lake Site Mean Morning NO_x Concentrations

June-August weekday 0400-0700 LST



Bloomfield Site Mean Morning NOx Concentrations
June-August weekday 0400-0700 LST



no NOx data in 2009

Navajo Lake and Bloomfield Sites Mean Morning NO_x Concentrations

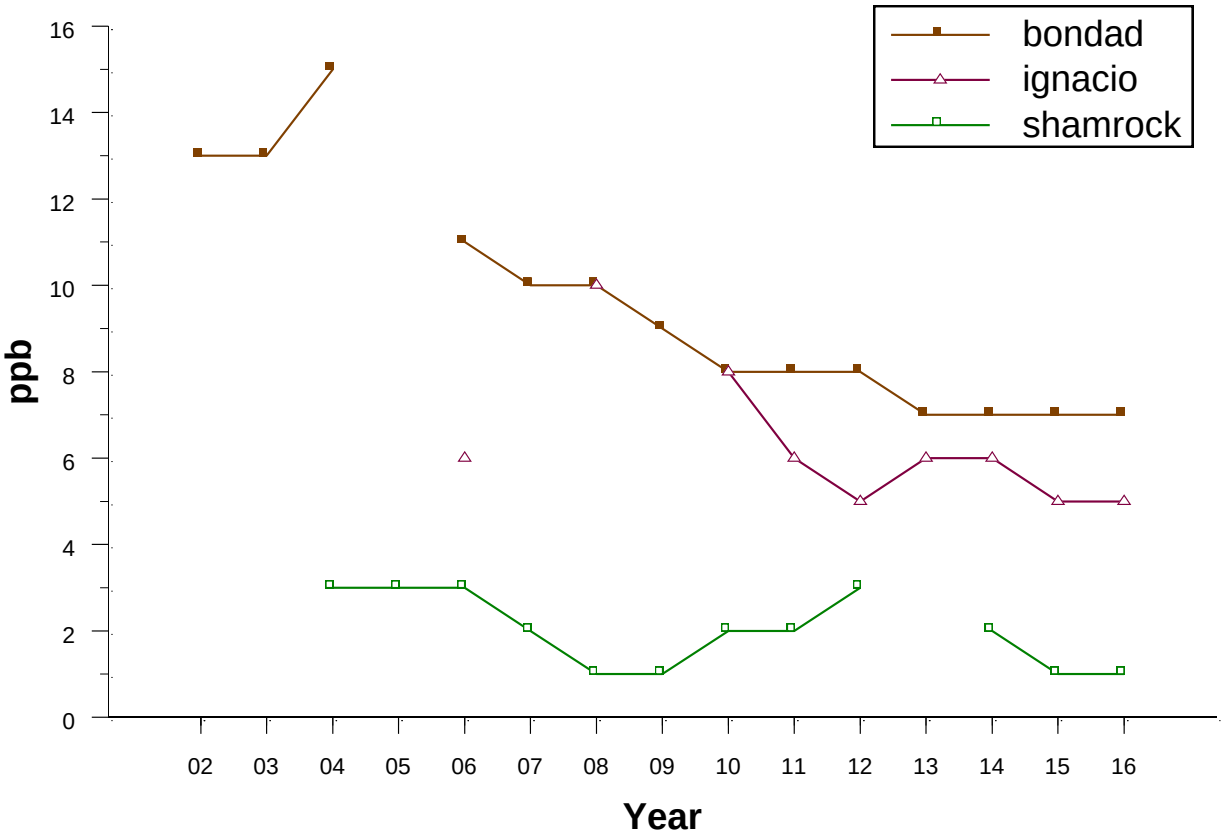
- Both the Bloomfield and Navajo Lake sites exhibit summer weekday NO_x diurnal profile peaks during the morning hours 0400-0700 LST. The Substation site, located furthest west, exhibits its summer weekday NO_x diurnal profile peak two hours later from 0600-0900 LST.

- The Navajo Lake site, a rural site, is impacted primarily from area emissions such as those from oil/gas production. Ambient NO_x concentrations at this site have decreased from 2006 to 2016, with the 2016 ambient concentrations statistically significantly lower than those recorded from 2006-2013.

- The Bloomfield site is influenced by both mobile source (car/truck) and industry (local refinery) emissions, with the wind sectors to the NE, NW, and SW dominated by mobile source emissions and the SE sector dominated by both industry and mobile source emissions. Overall ambient NO_x concentrations at this site have significantly decreased since a 2007 peak.

Southern Colorado Sites Mean Morning NO_x Concentrations

June-August weekday; >70% data capture



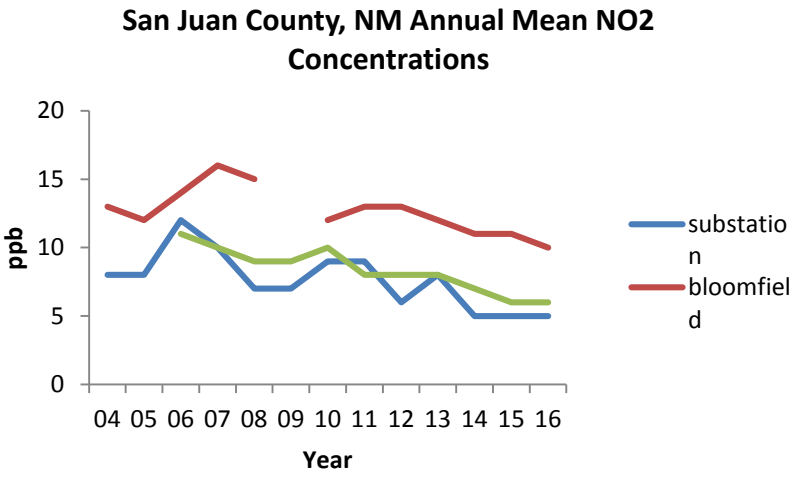
0400-0700 LST for Bondad

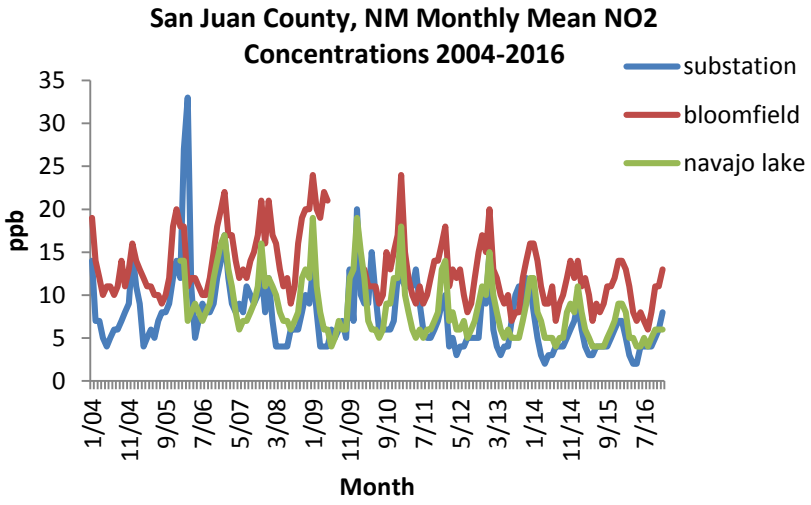
0600-0900 LST for Ignacio and Shamrock

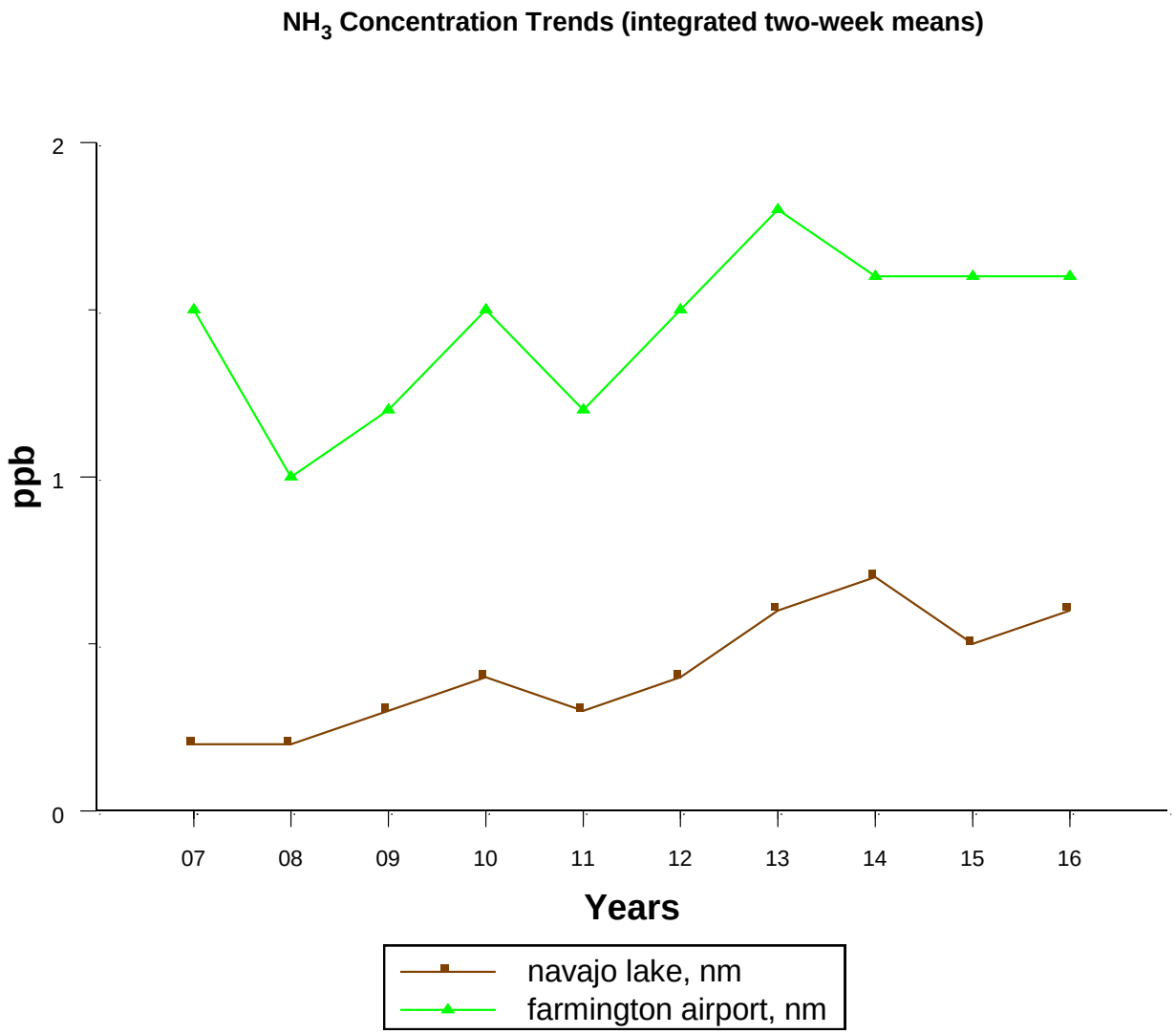
NO_x concentrations have also been declining in southern Colorado.

Annual and Monthly Mean NO_2 Trends

- Overall long-term trends are down at all three sites in San Juan County. There was a notable decrease in annual NO_2 concentrations at the Substation site from 2013-2014 during the shutdown of Units 1, 2 and 3 at the Four Corners Power Plant.







Ambient ammonia concentrations have been increasing
but visibility data so far has not shown degradation;
Will continue to study both future ammonia concentration trends
and visibility data.

New Ozone NAAQS

- EPA released a final NAAQS on Oct. 1, 2015
- Primary standard = 70 ppb
  - No change in the form
  - Based on the 3-year average of the 4th maximum 8-hour values (truncated)
  - Non-overlapping provision (applies to 17 hours only)
- Secondary standard =70 ppb
  - Same level and form as the primary standard
  - Approximately the same level of protection as a W126 standard of 17 ppm-hours

New Ozone NAAQS (continued)

- AQI break-points changed to match NAAQS level
- Monitoring season changed for 32 states
- PAMS monitoring required at NCore sites in existing non-attainment areas with populations > 1 million
  - To include hourly speciated VOCs, 8-hour carbonyls, O3, NO/NO2/NOy, and meteorology
- Enhanced Monitoring Plan required to be developed for all moderate or higher ozone NAAs to look at what additional monitoring is appropriate or needed
- Added a new Federal Reference Method analyzer based on chemiluminesence
- Grandfathered PSD sources with complete applications as of final publication

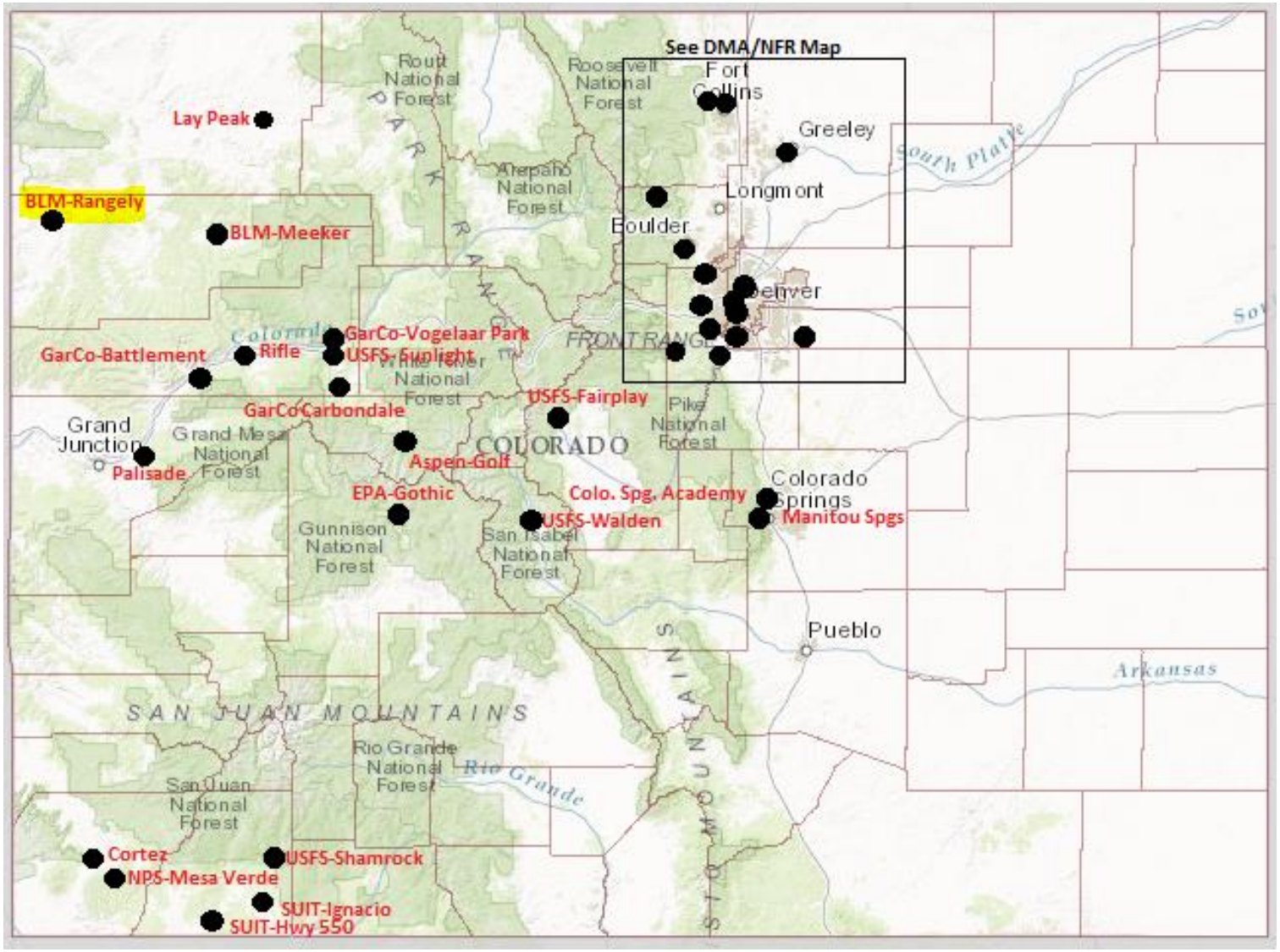
Timeline

- October 1, 2015 EPA revised the 8-hour national ambient air quality standard for ozone
  - From 0.075 ppm to 0.070 ppm
- States required to submit initial recommendations for area designations by October 1, 2016
  - Based on 2013-2015 data
- EPA will make final designations by Fall 2017
  - Based on 2014-2016 data

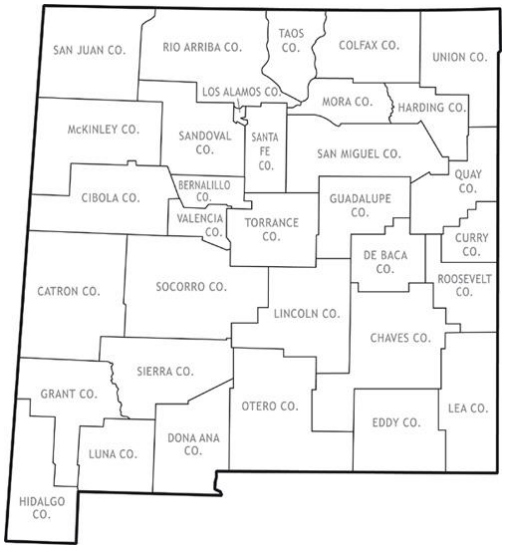
Designation Steps

- Identify areas violating standard
- Perform 5 factor analysis for violating areas:
  1. Air Quality Data
  2. Emissions and Emissions-Related Data
  3. Meteorology
  4. Geography/Topography
  5. Jurisdictional Boundaries

Colorado Recommendations



NM Recommendations



- Part of Southern Dona Ana County – nonattainment, remainder of state – attainment/unclassifiable. (For 2013-2015, the nonattainment area in southern Doña Ana County would include Sunland Park and Santa Teresa. Using 2014-2016 data, the nonattainment area only includes Sunland Park.)

Figure 7-1: Recommended nonattainment boundary for the Sunland Park Area.

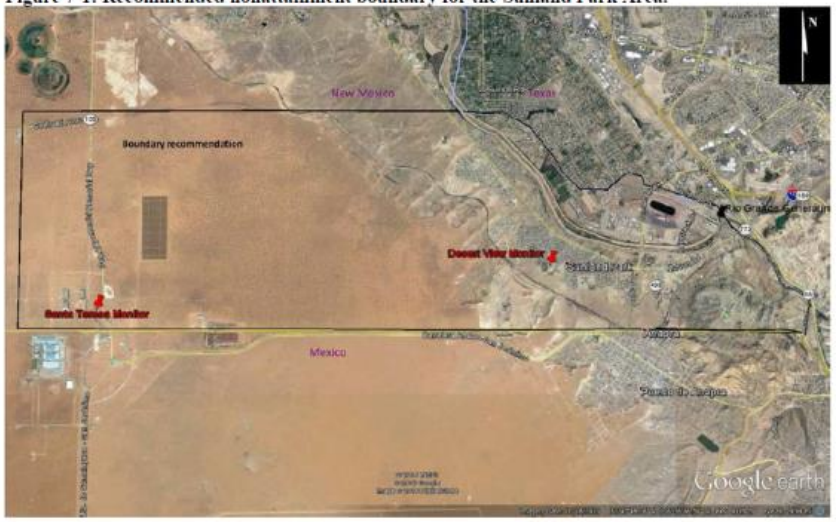
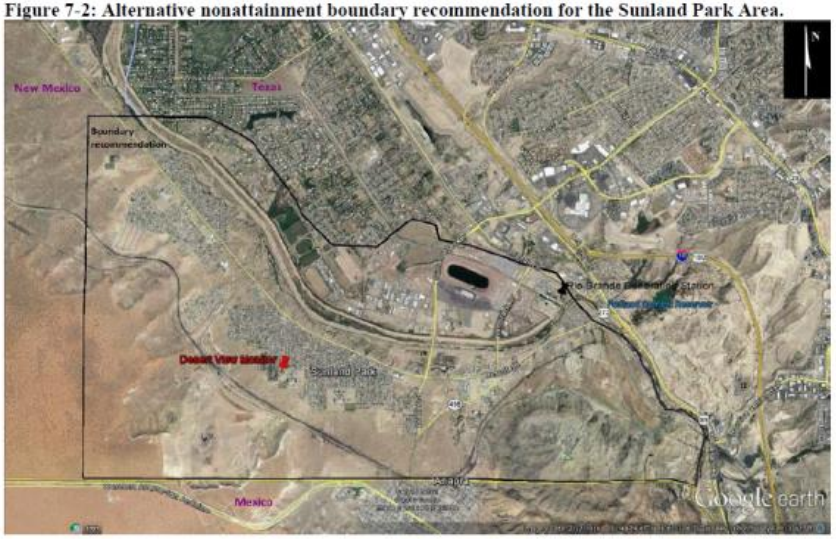


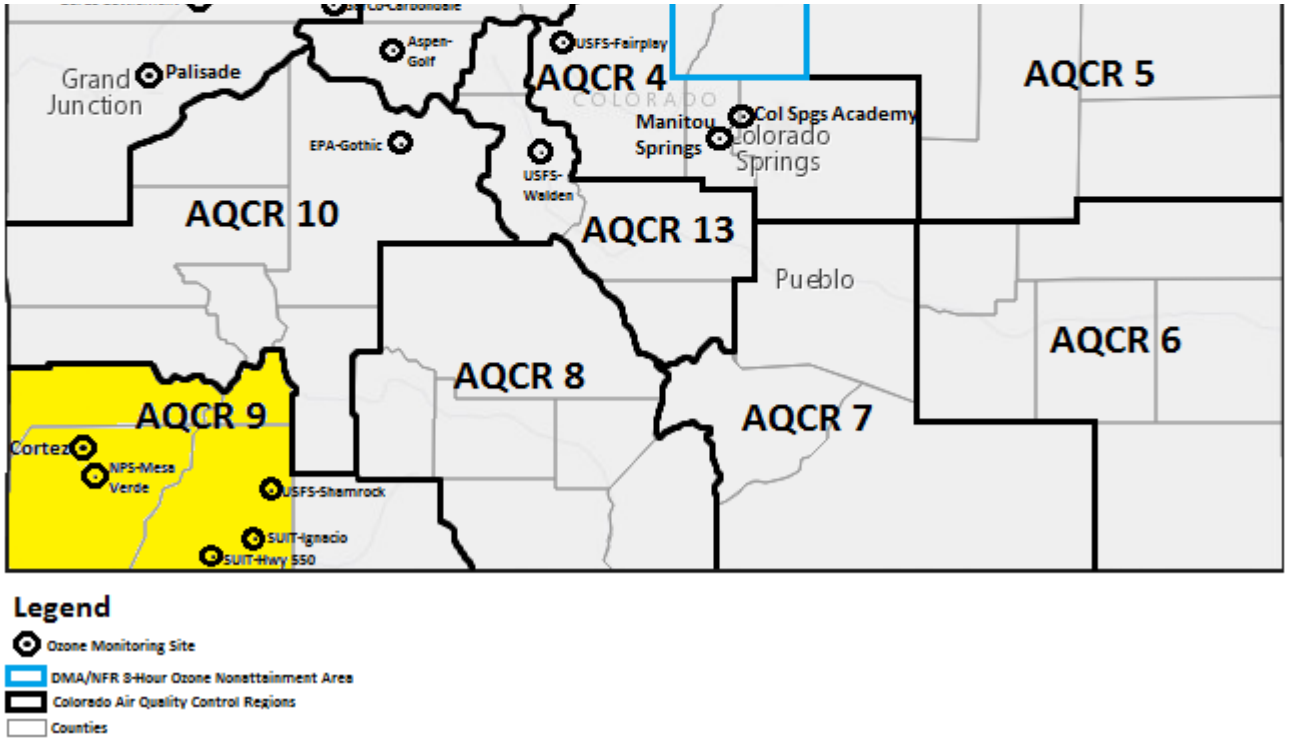
Figure 7-2: Alternative nonattainment boundary recommendation for the Sunland Park Area.



Questions?

Colorado AQCR 9: Population & Emissions

County	AQCR	Recommended 8-Hour Ozone Designation	Total Precursors				Population	
			Total (tpy)	Controllable (tpy)	Uncontrolled (tpy)	Rank	July 2015 (Estimate)	Rank
Archuleta	9	Attainment/Unclassifiable	24,585	2,451	22,134	24	12,352	35
Dolores	9	Attainment/Unclassifiable	15,204	2,277	12,927	40	1,978	58
La Plata	9	Attainment/Unclassifiable	40,689	18,932	21,757	11	54,688	14
Montezuma	9	Attainment/Unclassifiable	36,695	13,154	23,541	14	26,168	21
San Juan	9	Attainment/Unclassifiable	4,118	1,193	2,925	64	701	64



- Monitoring data for La Plata & Montezuma Counties indicates attainment of revised 8-hour Ozone NAAQS
- Total population and precursor emissions well below El Paso County
- Contributions to ozone from local sources is small, although the extent of transport into the area is unknown