Annual Air Monitoring Network Plan for Minnesota

2014

Minnesota Pollution Control Agency

Federal Regulation

40 CFR § 58.10(a) (1) Annual monitoring network plan and periodic network assessment
Beginning July 1, 2007, the State, or where applicable local, agency shall adopt and submit to the Regional Administrator an annual monitoring network plan which shall provide for the establishment and maintenance of an air quality surveillance system that consists of a network of SLAMS monitoring stations including FRM, FEM, and ARM monitors that are part of SLAMS, NCore stations, STN stations, State speciation stations, SPM stations, and/or, in serious, severe and extreme ozone nonattainment areas, PAMS stations, and SPM monitoring stations. The plan shall include a statement of purposes for each monitor and evidence that siting and operation of each monitor meets the requirements of appendices A, C, D, and E of this part, where applicable. The annual monitoring network plan must be made available for public inspection for at least 30 days prior to submission to EPA.

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Acronyms, Abbreviations, and Definitions

AIRMoN – Atmospheric Integrated Research Monitoring Network
Air Toxics – suite of parameters that includes VOCs, carbonyls, and metals
AQI – Air Quality Index
AQS – Air Quality System: EPA's repository of ambient air quality data
BAM – Beta Attenuation Mass
BWCAW – Boundary Waters Canoe Area Wilderness
CAA – Clean Air Act
CAS – Chemical Abstracts Service
CBSA – Core Base Statistical Area
CFR – Code of Federal Regulations
CO – carbon monoxide
Criteria Pollutants – the six pollutants regulated by the 1970 Clean Air Act (particulate matter, ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, and lead)
CSN – Chemical Speciation Network
EPA – Environmental Protection Agency
FEM – Federal Equivalent Method
FRM – Federal Reference Method
GC/MS – Gas Chromatography/Mass Spectrometry
H_2S – hydrogen sulfide
HAP – Hazardous Air Pollutant
Hg – mercury
HPLC – High Pressure Liquid Chromatography
HRV – Health Risk Value
ICP-AES – Inductively Coupled Plasma Atomic Emission Spectrometry: a technique used for metals analysis
IMPROVE – Interagency Monitoring of Protected Visual Environments
IO-3.1 – EPA method for extracting metals from TSP filters
IO-3.4 – EPA method for analyzing metals utilizing ICAP
LADCO – Lake Michigan Air Directors Consortium
MAAQS – Minnesota Ambient Air Quality Standard
MDH – Minnesota Department of Health
MDN – Mercury Deposition Network
MPCA – Minnesota Pollution Control Agency
MSA – Metropolitan Statistical Area
NAAQS – National Ambient Air Quality Standard
NADP – National Atmospheric Deposition Program
NCore – National Core Monitoring Network
NH_3 – ammonia
NO – nitric oxide
NO_2 – nitrogen dioxide
NO_x – oxides of nitrogen
NO_y – total reactive nitrogen
NPAP – National Performance Audit Program
NTN – National Trends Network
O_3 – ozone
PAH – Polycyclic Aromatic Hydrocarbon
Pb – lead
PEP – Performance Evaluation Program
PFC – perfluorochemical
$PM_{2.5}$ – particulate matter less than 2.5 microns in diameter (fine particulate matter)
PM_{10} – particulate matter less than 10 microns in diameter
ppb – parts per billion
ppm – parts per million
PQAO – Primary Quality Assurance Organization
QAPP – Quality Assurance Project Plans
QA/QC – Quality Assurance/Quality Control
QMP – Quality Management Plan
SLAMS – State and Local Air Monitoring Stations
SO_2 – sulfur dioxide
SPM – special purpose monitoring
TEOM – Tapered Element Oscillating Microbalance
TMDL – Total Maximum Daily Load
TO-11A – EPA method for analyzing carbonyls utilizing HPLC
TO-15 – EPA method for analyzing VOCs utilizing GC/MS
tpy – tons per year
TRS – total reduced sulfur
TSP – total suspended particulate matter
U of M – University of Minnesota
USDA – United States Department of Agriculture
USG – unhealthy for sensitive groups
USGS – United States Geological Survey
VOC – Volatile Organic Compound

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Introduction

The Minnesota Pollution Control Agency (MPCA) monitors outdoor air quality throughout Minnesota. There are many reasons to monitor the quality of our outdoor air. The data collected by the MPCA helps determine major sources of ambient air pollution in Minnesota and whether we are protecting the public from its harmful health effects. Data are also used to address ways to reduce pollution levels and track concentrations of pollutants over time.

The MPCA's air quality data are used to determine compliance with National Ambient Air Quality Standards (NAAQS) and Minnesota Ambient Air Quality Standards (MAAQS). In 1970, the Clean Air Act (CAA) established NAAQS for six pollutants known to cause harm to human health and the environment. The CAA requires the MPCA to monitor these pollutants, called criteria pollutants, and report the findings to the U. S. Environmental Protection Agency (EPA). The criteria pollutants are particulate matter, lead, ozone, nitrogen dioxide, sulfur dioxide, and carbon monoxide. The MPCA also monitors Minnesota's air for other pollutants called air toxics. Air toxics include a wide range of chemicals that are known or suspected to affect human health. These pollutants do not have federal standards; however, levels found in Minnesota are compared to health benchmarks established by the Minnesota Department of Health (MDH), the EPA, and the State of California.

This Air Monitoring Network Plan is an annual report that is issued by the MPCA. It is a requirement of the Code of Federal Regulations (40 CFR 58) that were established by the EPA on October 17, 2006. The purpose of this report is to provide evidence that current regulations are being met for our air monitoring network, to detail any changes proposed for the 18 months following its publication, and to provide specific information on each of the MPCA's existing and proposed monitoring sites.

In addition to this plan, the EPA required states to complete a network assessment every five years. Under the direction of the Lake Michigan Air Directors Consortium (LADCO), Minnesota collaborated with other states in our region for the first network assessment which was completed in 2010. The network assessment provides a detailed evaluation of the regional air monitoring network. It contains a network history, a re-evaluation of the types of pollutants monitored, and an evaluation of the network's objectives and costs. It also includes spatial analysis of ambient air monitoring data and a reconsideration of monitor placement based on changes in land use and population. Overall, the report noted that states do not currently have sufficient funding and staffing available to meet all of the new EPA monitoring requirements and suggests a priority order for monitoring objectives. A comprehensive regional monitoring network for $PM_{2.5}$ and ozone remains the highest priority since nonattainment of the $PM_{2.5}$ and ozone standards is the most important air quality problem from a regional perspective.

Specifically for Minnesota, the Regional Network Assessment suggested that MPCA may want to review a cluster of “low value” $PM_{2.5}$ sites in Northeast Minnesota including monitors in Virginia, Duluth, and Mille Lacs. These monitors do not show concentrations of $PM_{2.5}$ likely to exceed the standard and may be redundant. The MPCA removed the Mille Lacs $PM_{2.5}$ monitor in 2010. The Virginia monitor is important since it is the closest to Minnesota’s mining industry, while the Duluth $PM_{2.5}$ monitors track concentrations in Minnesota’s largest northern city and port.

The assessment also suggested new investments including establishing an appropriate upwind rural background $PM_{2.5}$ monitor for the Twin Cities. An upwind site would help determine to what extent high $PM_{2.5}$ concentrations in the Twin Cities are the result of regional transport or local emission sources. Wind direction analysis indicates that the most appropriate location would be between the Twin Cities and Rochester. The MPCA is considering establishing such a site; however, an upwind site will not be added in 2014 due to resource limitations and the difficulty in establishing an upwind site for the Twin Cities that would not be unduly influenced by pollutant emissions from Rochester. A final recommendation was to continue replacing aging filter based $PM_{2.5}$ monitors with semi-continuous federal equivalent method (FEM) monitors. MPCA continues to add semi-continuous FEM monitors to the Minnesota network.

The complete Regional Network Assessment can be found on LADCO’s website at http://www.ladco.org/reports/general/Regional_Network_Assessment/index.html.

Network overview

The MPCA monitors ambient air quality at 53 sites throughout Minnesota. This includes monitoring at three tribal sites, four Interagency Monitoring of Protected Visual Environments (IMPROVE) sites, three Chemical Speciation Network (CSN) sites, and ten National Acid Deposition Program (NADP) sites. Figure 1 shows all of these sites.

Site location is partly dependent upon population density; therefore, the majority of sites are in the Twin Cities metropolitan area. For the purposes of this report, any sites in the following eight counties are considered the Twin Cities metropolitan area: Hennepin, Ramsey, Wright, Anoka, Washington, Dakota, Scott, and Carver. The area of the state that lies outside the Twin Cities metropolitan area is commonly referred to as Greater Minnesota.

The maps on the following pages show sites labeled according to their MPCA, NADP, or Interagency Monitoring of Protected Visual Environments (IMPROVE) site identification numbers. Figure 1 shows the Greater Minnesota sites and figure 2 shows the Twin Cities metropolitan area sites.

Throughout the report, sites are referred to using the site name or the city where the site is located and the MPCA, NADP, or IMPROVE site identification number.

Site Selection

The selection of air monitoring sites is usually based on at least one of the basic monitoring objectives listed below:

- determine representative concentrations and exposure in areas of high population density;
- determine the highest concentrations of pollutants in an area based on topography and/or wind patterns;
- judge compliance with and/or progress made towards meeting the NAAQS within a geographic area
- observe pollution trends throughout the region, including non urban areas;
- determine the highest concentrations of pollutants within the state based on the known atmospheric chemistry of specific pollutants and wind patterns;
- determine the extent of regional pollutant transport to and from populated areas;
- determine the impact on ambient pollution levels of major sources or source categories;
- validate control strategies that prevent or alleviate air pollution episodes near major sources;
- determine the source/transport related impacts in more rural and remote areas;
- provide a data base for research and evaluation of air pollution effects within geographic areas; or
- determine general background concentration levels.

The exact location of a site is most often dependent on the logistics of the area chosen for monitoring, such as site access, security and power availability.

Network scales

Since it is not possible to monitor everywhere in the state, the concept of spatial scales is used to clarify the link between monitoring objectives and the physical location of the monitor. When designing an air monitoring network one of the following six objectives should be determined:

1. the highest concentrations expected to occur in the area covered by the network;
2. representative concentrations in areas of high population density;
3. the impact of specific sources on ambient pollutant concentrations;
4. general background concentration levels;
5. the extent of regional transport among populated areas and in support of secondary standards; or
6. welfare-related impacts in the more rural and remote areas.

The EPA developed a system which specifies an exclusive area or spatial scale that an air monitor represents. The goal in establishing air monitoring sites is to correctly match the spatial scale that is most appropriate for the monitoring objective of the site. Table 1 displays the recommended siting scales for the appropriate monitoring objective.

The representative measurement scales are:

- **Micro Scale (10-100) m -** defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters. Measurements on the micro scale typically include concentrations in street canyons, intersections, and in areas next to major emission sources.
- **Middle Scale (100-1,000) m -** defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 to 1,000 meters.
- **Neighborhood Scale (1-4) km -** defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the one to four kilometers range. Generally, these stations represent areas with moderate to high population densities.
- **Urban Scale (4-50) km -** defines the overall, citywide conditions with dimensions on the order of four to 50 kilometers. This scale represents conditions over an entire metropolitan area and is useful in assessing city-wide trends in air quality.
- **Regional Scale/ Background (50-1,000) km -** usually a rural area of reasonably homogeneous geography and extends from tens to hundreds of kilometers.
- **National/Global -** concentrations characterizing the nation and the globe as a whole.

Table 1: Network scales

Monitoring Objective	Appropriate Siting Scales
Highest Concentration	Micro, Middle, Neighborhood (sometimes Urban)
Population Exposure	Neighborhood, Urban
Source Impact	Micro, Middle, Neighborhood
General/Background	Urban, Regional (sometimes Neighborhood)
Regional Transport	Urban, Regional
Welfare – Related	Urban, Regional

Table 2: Site information – Greater Minnesota

MPCA Site ID	City	Site name	AQS Site ID	Address	LAT	LONG	Year Started
MN08*	Hovland	Hovland	(none)	(open field)	47.8472	-89.9625	1996
MN16*	Balsam Lake	Marcell	(none)	Marcell Experimental Forest	47.5311	-93.4686	1978
MN23*	Pillager	Camp Ripley	(none)	(open field)	46.2494	-94.4972	1983
MN27*	Lamberton	Lamberton	(none)	U of M SW Agricultural Research and Outreach Center	44.2369	-95.3010	1979
MN28*	Sandstone	Grindstone Lake	(none)	Audubon Center of the North Woods	46.1208	-93.0042	1996
MN32* VOYA2**	International Falls	Voyageurs	27-137-9000	Voyageurs National Park - Sullivan Bay	48.4128	-92.8292	2000
MN99*	Finland	Wolf Ridge	(none)	6282 Cranberry Rd	47.3875	-91.1958	1996
1300	Virginia	Virginia	27-137-7001	327 First St S	47.5212	-92.5393	1968
2013	Detroit Lakes	Detroit Lakes	27-005-2013	26624 N Tower Rd	46.8499	-95.8463	2004
3051	Mille Lacs	Mille Lacs	27-095-3051	HCR 67 Box 194	46.2052	-93.7594	1997
3052	Saint Cloud	Talahi School	27-145-3052	1321 Michigan Ave SE	45.5497	-94.1335	1998
3053	Saint Cloud	Grede Foundries	27-145-3053	5200 Foundry Circle	45.5646	-94.2263	2010
3204	Brainerd	Brainerd Airport	27-035-3204	16384 Airport Rd	46.3921	-94.1444	2004
4210	Marshall	Marshall Airport	27-083-4210	West Highway 19	44.4559	-95.8363	2004
5008	Rochester	Ben Franklin School	27-109-5008	1801 9th Ave SE	43.9949	-92.4504	1997
5302	Stanton	Stanton Air Field	27-049-5302	1235 Highway 17	44.4719	-93.0126	2003
7001 MN18* BOWA1**	Ely	Fernberg Road	27-075-0005 27-075-9000	Fernberg Rd	47.9466	-91.4956	1977
7416	Cloquet	Cloquet	27-017-7416	175 University Rd	46.7030	-92.5233	2001
7526	Duluth	Torrey Building	27-137-0018	314 W Superior St	46.7834	-92.1027	1976
7545	Duluth	Oneota Street	27-137-0032	37^{th} Ave W & Oneota St	46.7516	-92.1413	1985
7549	Duluth	Michigan Street	27-137-7549	1532 W Michigan St	46.7694	-92.1194	1994
7550	Duluth	WDSE	27-137-7550	1202 East University Circle	46.8182	-92.0894	1998
7554	Duluth	Laura MacArthur School	27-137-7554	720 N Central Ave	46.7437	-92.1660	2012
7555	Duluth	Waseca Road	27-137-7555	Waseca Industrial Rd	46.7306	-92.1634	2001
7810	Grand Portage	Grand Portage	27-031-7810	27 Store Rd	47.9701	-89.6910	2005
BLMO1**	Luverne	Blue Mounds	27-133-9000	1410 161^{st} St	43.7158	-96.1913	2002
GRRI1**	Winona	Great River Bluffs	27-169-9000	43605 Kipp Dr	43.9373	-91.4052	2002

*NADP Site ID
**IMPROVE Site ID

Figure 1: 2013 Air quality monitoring sites in Greater Minnesota

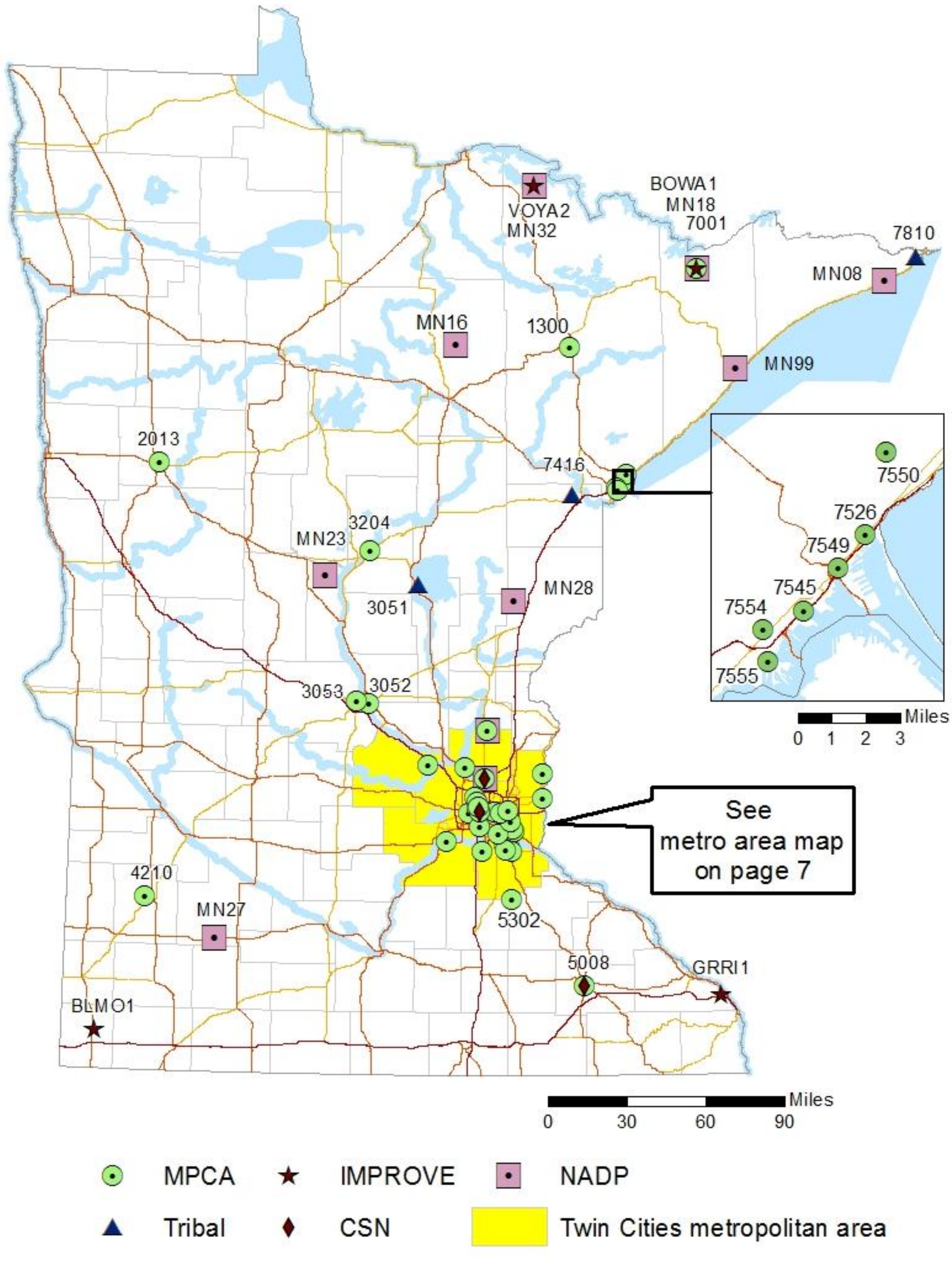
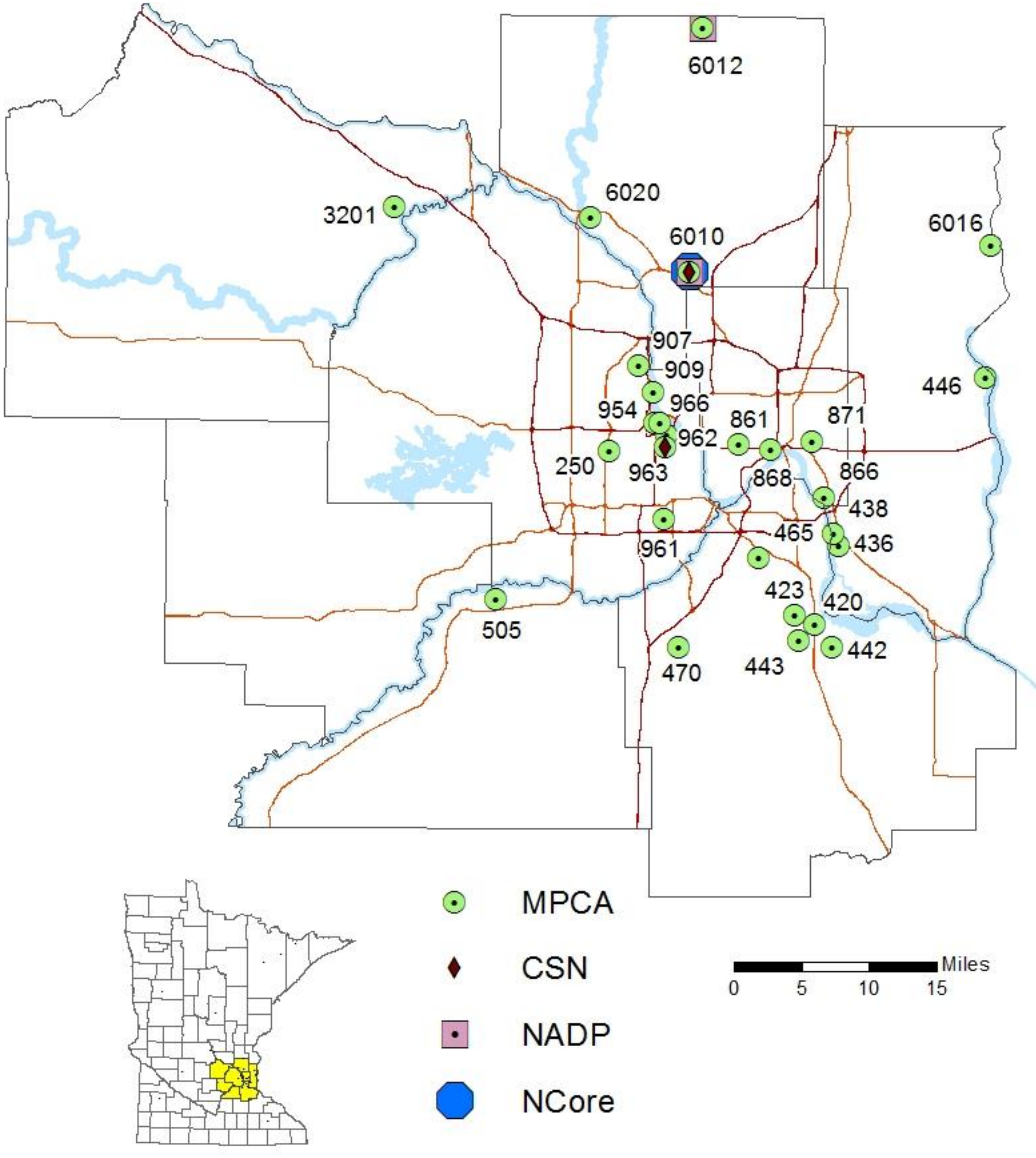


Table 3: Site information – Twin Cities metropolitan area

MPCA Site ID	City	Site name	AQS Site ID	Address	LAT	LONG	Year Started
250	St Louis Park	St. Louis Park	27-053-2006	5005 Minnetonka Blvd	44.9481	-93.3429	1972
420	Rosemount	FHR 420	27-037-0020	12821 Pine Bend Tr	44.7632	-93.0325	1972
423	Rosemount	FHR 423	27-037-0423	2142 120th St E	44.7730	-93.0627	1990
436	St. Paul Park	NTE 436	27-163-0436	649 5th St	44.8473	-92.9956	1989
438	Newport	NTE 438	27-163-0438	4th Ave & 2nd St	44.8599	-93.0035	1995
442	Rosemount	FHR 442	27-037-0442	County Rd 42	44.7385	-93.0056	2000
443	Rosemount	FHR 443	27-037-0443	14035 Blaine Ave E	44.7457	-93.0554	2008
446	Bayport	Point Road	27-163-0446	22 Point Rd	45.0280	-92.7738	2007
465	Eagan	Gopher Resources	27-037-0465	Hwy 149 & Yankee Doodle Rd	44.8343	-93.1163	2006
470	Apple Valley	Apple Valley	27-037-0470	225 Garden View Dr	44.7387	-93.2373	2000
505	Shakopee	B.F. Pearson School	27-139-0505	917 Dakota St	44.7894	-93.5125	2000
861	St. Paul	Lexington Avenue	27-123-0050	1088 W University Ave	44.9556	-93.1459	1987
866	St. Paul	Red Rock Road	27-123-0866	1450 Red Rock Rd	44.8994	-93.0171	1997
868	St. Paul	Ramsey Health Center	27-123-0868	555 Cedar St	44.9507	-93.0985	1998
871	St. Paul	Harding High School	27-123-0871	1540 East 6th St	44.9593	-93.0359	1998
907	Minneapolis	Humboldt Avenue	27-053-1007	4646 N Humboldt Ave	45.0397	-93.2987	1966
909	Minneapolis	Pacific Street	27-053-0909	3104 Pacific St	45.0121	-93.2767	2013
954	Minneapolis	Arts Center	27-053-0954	528 Hennepin Ave	44.9790	-93.2737	1989
961	Richfield	Richfield Intermediate School	27-053-0961	7020 12th Ave S	44.8756	-93.2588	1999
962	Minneapolis	Near-Road	27-053-0962	1444 18th St E	44.9652	-93.2548	2013
963	Minneapolis	H.C. Andersen School	27-053-0963	2727 10th Ave S	44.9535	-93.2583	2001
966	Minneapolis	City of Lakes	27-053-0966	309 2nd Ave S	44.9793	-93.2611	2002
3201	St. Michael	St. Michael	27-171-3201	101 Central Ave W	45.2092	-93.6690	2003
6010 MN98*	Blaine	Anoka Airport	27-003-1002	2289 CO Rd J	45.1407	-93.2220	1979
6012 MN01*	East Bethel	Cedar Creek	27-003-1001	2660 Fawn Lake Drive NE	45.4018	-93.2031	1979
6016	Marine on St. Croix	Marine on St. Croix	27-163-6016	St. Croix Trail N	45.1680	-92.7651	2012
6020	Anoka	Federal Cartridge	27-003-6020	900 Ehlen Dr	45.1981	-93.3709	2010

*NADP Site ID

Figure 2: 2013 Air quality monitoring sites in the Twin Cities metropolitan area



Types of networks

Air monitoring networks are designed to satisfy a variety of purposes including monitoring compliance with the NAAQS, public reporting of the Air Quality Index (AQI), assessing population exposure and risk from air toxics, determining pollution trends, monitoring specific emissions sources, investigating background conditions, and evaluating computer models. Below are descriptions of the existing monitoring networks in operation in Minnesota.

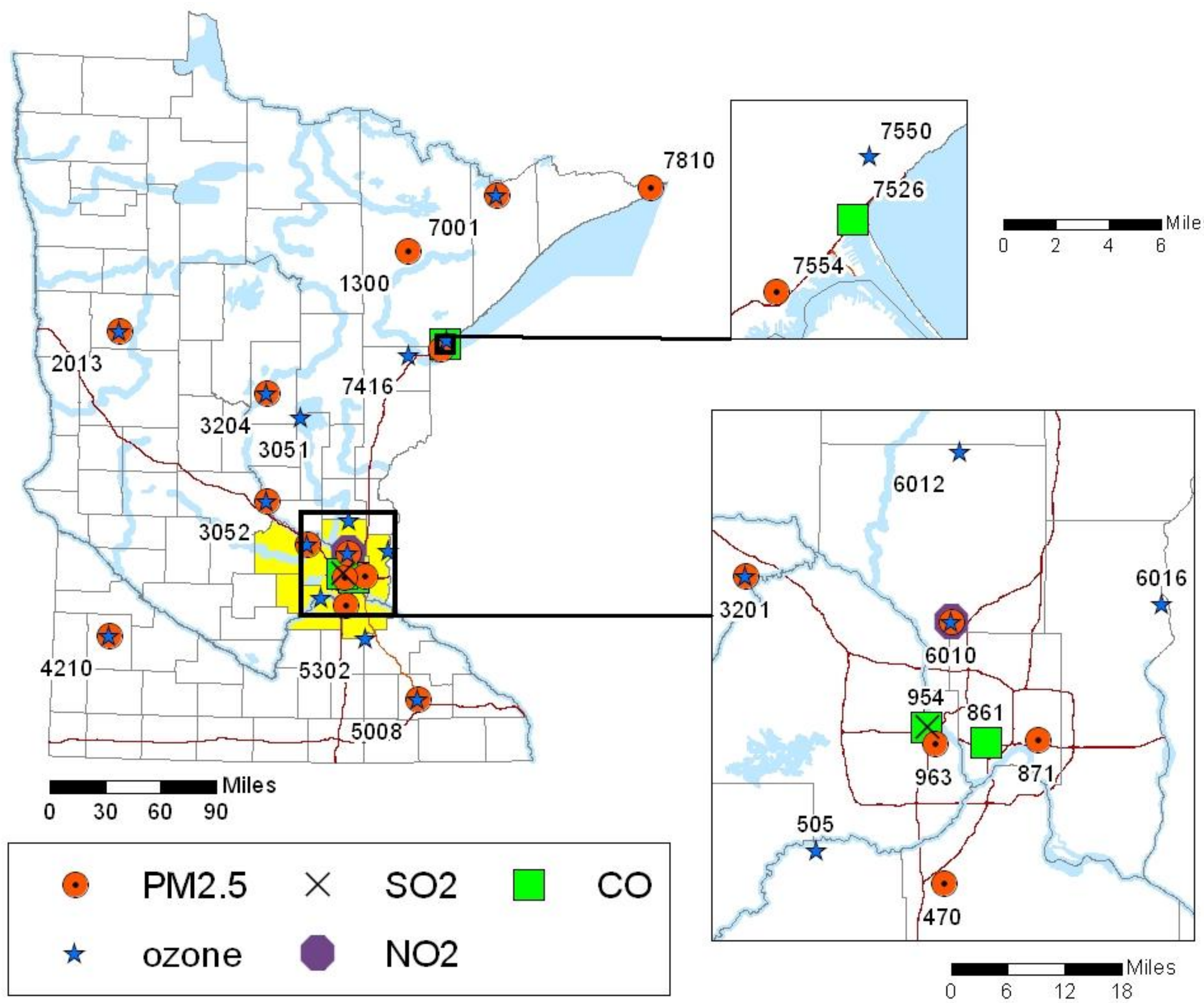
State and Local Air Monitoring Stations (SLAMS)

This network consists of about 3,500 monitoring sites across the United States. The size and distribution of the sites are largely determined by the needs of state and local air pollution control agencies to meet their respective State Implementation Plan (SIP) requirements and monitoring objectives. Most Minnesota monitoring sites are part of the SLAMS network.

Air Quality Index (AQI)

The AQI was developed by the EPA to provide a simple, uniform way to report daily air quality conditions. Minnesota AQI numbers are determined by hourly measurements of five pollutants: $PM_{2.5}$, ground-level ozone, SO_2, NO_2, and CO. The pollutant with the highest value determines the AQI for that hour. The most common pollutants to drive the AQI are $PM_{2.5}$ and ozone. AQI values are updated hourly and posted on the MPCA's web site at http://aqi.pca.state.mn.us. There are 24 sites in the AQI network in Minnesota (figure 3).

Figure 3: 2013 AQI Sites



Air quality is ranked as good, moderate, unhealthy for sensitive groups (USG), unhealthy, or very unhealthy (figure 4). If it is suspected through forecasting or monitoring that one of the four pollutants may be unhealthy for sensitive groups or higher, the MPCA issues an Air Pollution Health Alert to the media and to individuals who have signed up to receive e-mail alerts. Alerts allow the public to be proactive about protecting their health and reducing their own contributions to emissions and exposure to pollution. To receive e-mail alerts and air quality forecasts, sign up at http://mn.enviroflash.info

Figure 4: AQI categories

Figure 5 shows the number of good, moderate, and USG days at sites in Minnesota in 2012. Regions may not show a total of 365 days because of monitoring problems or non-operational days. In 2012, the cleanest air was in Ely with 325 good air days and 35 moderate days. The Twin Cities metropolitan area had the lowest number of good air quality days (182 days), experiencing 179 moderate days, 4 days considered unhealthy for sensitive groups, and one unhealthy day.

Figure 5: 2013 AQI days in Minnesota cities

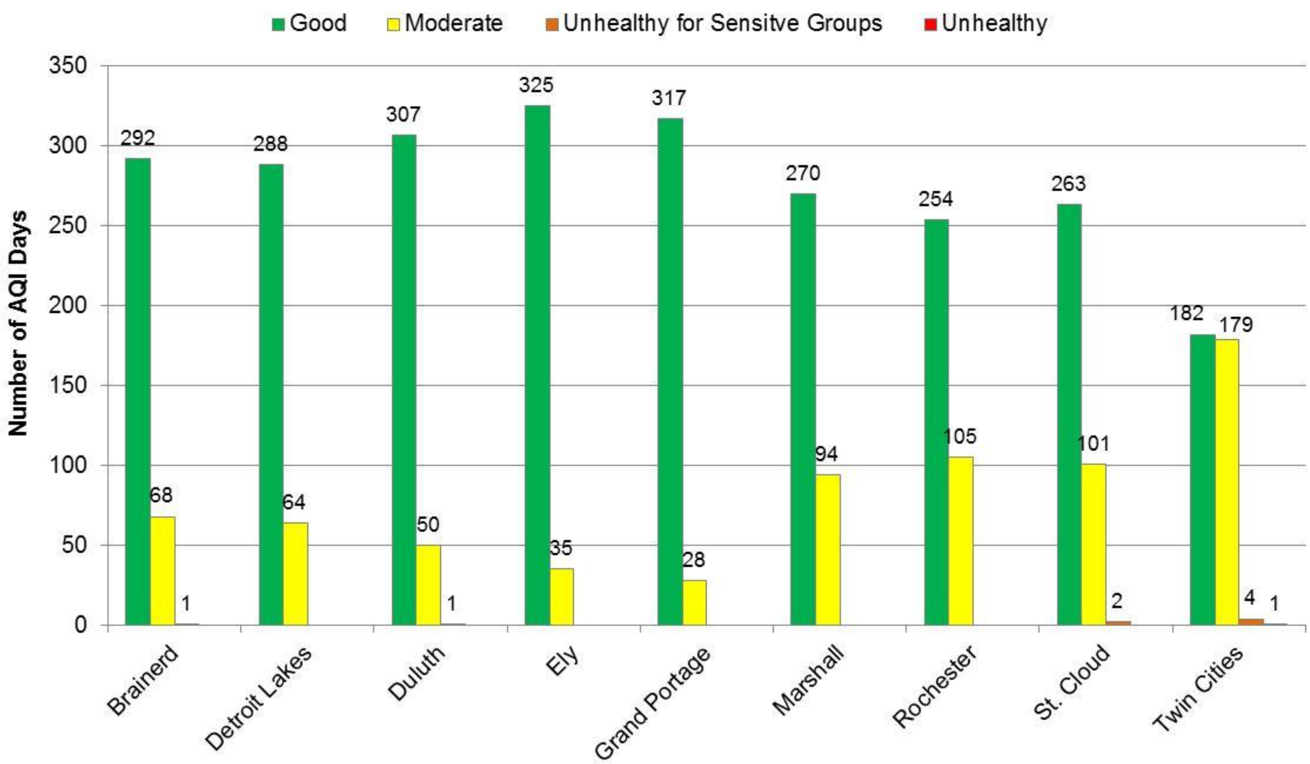


Table 4 summarizes the days the AQI exceeded 100 in 2012. In 2012, five days exceeded 100 AQI. Three of these days were due to ozone pollution and two were due to fine particle pollution. The number of ozone air quality alert days in 2012 was higher than recent years. This increase was likely due to an increase in the number of days with temperatures greater than 90°F in 2012. On June 27, ozone pollution reached levels considered unhealthy for everyone. Satellite images from June 27 indicate that smoke from wildfires in the western United States was present in the northern Twin Cities suburbs. The presence of wildfire smoke likely contributed to the high ozone concentrations.

Table 4: 2012 days with AQI greater than 100

	Brainerd	Detroit Lakes	Duluth	Ely	Grand Portage	Marshall	Rochester	St. Cloud	Twin Cities
18-May			104						101
27-Jun									158*
3-Jul									101
1-Dec								104	101
2-Dec	105							104	102
Total	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**5**

Ozone   **Fine Particles**

*Likely driven by a wildfire event (see page 9)

National Core Monitoring (NCore)

In October 2006, the United States Environmental Protection Agency (EPA) established the National Core (NCore) multi-pollutant monitoring network in its final amendments to the ambient air monitoring regulations for criteria pollutants (codified in 40 CFR parts 53 and 58). EPA requires each state to have at least one NCore site. Nationwide, there will be approximately 75 sites, mostly in urban areas.

At a minimum NCore monitoring sites must measure the parameters listed in Table 5.

Table 5: NCore parameters

Parameter	Comments
$PM_{2.5}$ speciation	Organic and elemental carbon, major ions and trace metals (24 hour average every 3rd day)
$PM_{2.5}$ FRM mass	24 hour average every third day
continuous $PM_{2.5}$ mass	one hour reporting interval
continuous $PM_{(10\text{-}2.5)}$ mass	in anticipation of a $PM_{(10\text{-}2.5)}$ standard
lead (Pb)	24 hour sample every sixth day (first sample is required on December 29, 2011)
ozone (O_3)	continuous monitor consistent with other O_3 sites
carbon monoxide (CO)	continuous monitor consistent with other CO sites
carbon monoxide (CO) trace level	continuous monitor capable of trace levels (low ppb and below)
sulfur dioxide (SO_2)	continuous monitor consistent with other SO_2 sites
sulfur dioxide (SO_2) trace level	continuous monitor capable of trace levels (low ppb and below)
oxides of nitrogen (NO_X)	continuous monitor consistent with other NO_X sites
total reactive nitrogen (NO/NO_y)	continuous monitor capable of trace levels (low ppb and below)
surface meteorology	wind speed and direction, temperature, barometric pressure, and relative humidity

The NCore monitoring network addresses the following monitoring objectives which are equally valued at each site:

- timely reporting of data to the public through AIRNow, air quality forecasting, and other public reporting mechanisms;
- support development of emission strategies through air quality model evaluation and other observational methods;
- accountability of emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors;
- compliance through establishing nonattainment/attainment areas by comparison with the NAAQS;
- support of scientific studies ranging across technological, health, and atmospheric process disciplines; support long-term health assessments that contribute to ongoing reviews of the National Ambient Air Quality Standards (NAAQS); and
- support of ecosystem assessments, recognizing that national air quality networks benefit ecosystem assessments and, in turn, benefit from data specifically designed to address ecosystem analysis.

In 2011, the MPCA began operating the full suite of NCore parameters at the Anoka County Airport in Blaine (6010). The Anoka County Airport monitoring station is located approximately 11 miles north of downtown Minneapolis and approximately 15 miles northwest of downtown St. Paul. A detailed report about Minnesota's NCore site in Blaine can be found on the MPCA website at www.pca.state.mn.us/air/monitoringnetwork.html. It is Appendix B of the 2010 Annual Air Monitoring Network Plan for the State of Minnesota.

Minnesota's NCore site focuses on providing multi-pollutant monitoring data. Numerous chemical and physical interactions between pollutants underlie the formation of particulates and ozone and the presence of other pollutants. In addition, emission sources tend to release multiple pollutants or their precursors simultaneously. Multi-pollutant monitoring will benefit health studies, long-term epidemiological studies, source apportionment studies, and air quality models.

Another focus of the NCore site in Blaine is trace level monitoring of carbon monoxide, sulfur dioxide, oxides of nitrogen, and total reactive nitrogen. These pollutants are dominant inorganic combustion products, as well as the most abundant inorganic elements in the atmosphere. Emissions reductions have reduced the concentrations of these pollutants in most urban and rural areas; however, they are precursor gases that continue to play an important role in the formation of ozone, particulate matter, and air toxics on both local and regional scales. The trace level data that this site provides will help us understand the role of these pollutants in the environment at levels far below the NAAQS. Trace level monitors have been at the NCore site in Blaine (6010) since 2009; however, due to performance issues with the monitoring equipment, trace level monitoring results have been unreliable. The MPCA is replacing the trace level monitoring instruments in the summer of 2013.

Near-Road NO_2

Since January 1, 2013, urban areas with a population greater than or equal to 500,000 are required to monitor for NO_2 within 50 meters of a heavily trafficked roadway. A second monitor is required near another major road in areas with either a population greater than or equal to 2.5 million people, or one or more road segments with an annual average daily traffic (AADT) count greater than or equal to 250,000 vehicles.

In Minnesota, the Minneapolis-St. Paul Core Based Statistical Area (CBSA), with a 2009 population estimate of 3,269,814 people, requires two near-road NO_2 monitors. Due to budget constraints, the EPA is modifying the Near-Road Monitoring Requirements to deploy the new near-road monitoring network in phases. The MPCA deployed one near-road monitoring site as part of the first phase of near-road monitor deployment at a new site along I-94 and I-35W in Minneapolis (962). See the Near-Road Air Monitoring in Minnesota Plan for a detailed description on how the location of the near-road monitoring site was chosen.

Interagency Monitoring of Protected Visual Environments (IMPROVE)

The IMPROVE Aerosol Network is a cooperative air quality monitoring effort between federal land managers; regional, state, and tribal air agencies; and the EPA. This program was established in 1985 in response to the 1977 Clean Air Act Amendments to aid in developing Federal and State implementation plans for the protection of visibility in Class I areas. Class I areas are National Parks and other wilderness areas that are designated by the United States Department of Agriculture (USDA). The IMPROVE network presently comprises 175 monitoring sites nationally.

The objectives of the IMPROVE network are:

- to establish current visibility and aerosol conditions in Class I areas;
- to identify chemical species and emission sources responsible for existing man-made visibility impairment;
- to document long-term trends for assessing progress towards the national visibility goal; and
- with the enactment of the Regional Haze Rule, to provide regional haze monitoring representing all visibility-protected federal class I areas where practical.

The IMPROVE sites also provide $PM_{2.5}$ speciation data; therefore, they are a key component of the EPA's national fine particle monitoring and are critical to tracking progress related to the Regional Haze Regulations. Minnesota has four IMPROVE Aerosol Network sites. They are located at Voyageurs National Park (VOYA2), near the Boundary Waters Canoe Area Wilderness at Ely (BOWA1), Blue Mounds State Park (BLMO1), and Great River Bluffs State Park (GRRI1). Figure 1 shows the locations of these sites.

Chemical Speciation Network (CSN)

The CSN is an EPA effort to gather data on the chemical composition of $PM_{2.5}$ and to provide a basic, long-term record of the concentration levels of selected ions, metals, carbon species, and organic compounds found in $PM_{2.5}$. EPA has established a chemical speciation network consisting of approximately 300 monitoring sites. The chemical speciation data provides data for assessing trends and developing mitigation strategies to reduce emissions and ambient concentrations.

The programmatic objectives of the CSN are:

- temporal and spatial characterization of aerosols;
- air quality trends analysis and tracking the progress of control programs;
- comparison of the chemical speciation data set to the data collected from the IMPROVE network; and development of emission control strategies.

There are currently three CSN sites in Minnesota. They are located in Minneapolis at the H.C. Andersen School (963), at the NCore site in Blaine (6010), and in Rochester (5008). Figure 1 shows the locations of these sites. In order to make the CSN data more comparable to the IMPROVE data, URG3000N carbon samplers were added to the CSN network over the last several years. Minneapolis (963) started sampling with a URG3000N carbon sampler on May 3, 2007 and Rochester (5008) started on October 4, 2009. The NCore site in Blaine (6010) was added to the network on January 1, 2011.

National Atmospheric Deposition Program (NADP)

Atmospheric deposition is monitored through the NADP. It has two active sub-networks in Minnesota: the National Trends Network (NTN) and the Mercury Deposition Network (MDN). There are currently over 250 sites in the NADP spanning the continental United States, Alaska, Puerto Rico, and the Virgin Islands. More information can be found at http://nadp.sws.uiuc.edu/.

NTN collects weekly precipitation samples for pH, sulfate, nitrate, ammonium, chloride, and base cations (such as calcium and magnesium). NTN provides long-term, high-quality data for determining spatial and temporal trends in the chemical composition of precipitation.

MDN collects precipitation samples for analysis of total mercury and methylmercury concentrations. Its objective is to develop a national database of the weekly concentrations of total mercury in precipitation and the seasonal and annual flux of total mercury in wet deposition. Samples are collected weekly and sent to Frontier Geosciences, Inc. in Seattle, Washington for analysis.

Minnesota has ten NADP sites; figure 1 shows the locations of these sites.

Industrial Networks

In Minnesota, air quality (AQ) permits are required to operate certain existing air emission facilities and to begin construction on either new facilities or modifications to existing facilities. Air quality permits contain a wide range of state and federal requirements to minimize the impact of the air emissions from these facilities on the environment. Some Federal programs involve performance standards for specific types of units or processes within a facility. Others have a wider scope and involve addressing the impact of newly constructed facilities, or modifications to existing facilities, on ambient air quality.

Facilities that are required to monitor ambient air quality near their facility get assistance from MPCA with siting evaluations, instrument performance audits, and submitting data to the EPA's AQS. The facilities are responsible for their own data validation and for other QA/QC activities.

The MPCA is currently assisting the following facilities:

- Andersen Corporation in Bayport, MN
- Boise White Paper, L.L.C. in International Falls, MN
- Great Plains Sand in Jordan, MN
- Northshore Mining Company in Silver Bay, MN
- Magnetation near Keewatin, MN

Clean Air Status and Trends Network (CASTNET)

The Clean Air Status and Trends Network (CASTNET) is a national air quality monitoring network designed to provide data to assess trends in air quality, atmospheric deposition, and ecological effects due to changes in air pollutant emissions. CASTNET began collecting measurements in 1991 with the incorporation of 50 sites from the National Dry Deposition Network, which had been in operation since 1987. CASTNET provides long-term monitoring of air quality in rural areas to determine trends in regional atmospheric nitrogen, sulfur, and ozone concentrations and deposition fluxes of sulfur and nitrogen pollutants in order to evaluate the effectiveness of national and regional air pollution control programs. CASTNET operates more than 80 regional sites throughout the contiguous United States, Alaska, and Canada. Sites are located in areas where urban influences are minimal. More information can be found at http://epa.gov/castnet.

There is one CASTNET site in Minnesota, located at Voyageurs National Park. This site is operated by the National Park Service; the MPCA does not have any role in this monitoring.

Quality Assurance/Quality Control (QA/QC) program

The purpose of the QA/QC program is to assure the quality of data obtained from the MPCA air monitoring networks. The MPCA meets or exceeds the QA requirements defined in 40 CFR 58 and all applicable appendices.

The QA/QC program includes but is not limited to the following activities:

- instrument performance audits,
- monitor siting evaluations,
- precision and span checks,
- bias determinations,
- flow rate audits,
- leak checks, and
- data validation.

For independent quality assurance activities, the MPCA participates in the National Performance Audit Program and the Performance Evaluation Program for criteria pollutant monitoring and performance. Additional inter-laboratory comparisons are performed quarterly for air toxics monitoring.

As the Primary Quality Assurance Organization (PQAO) for ambient air monitoring activities in Minnesota, the MPCA operates under an EPA approved Quality Management Plan (QMP) and utilizes Quality Assurance Project Plans (QAPP) for each statewide monitoring network. The primary purpose of the QAPP is to provide an overview of the project, describe the need for the measurements, and define QA/QC activities to be applied to the project. All other ambient air monitoring initiatives including state, tribal, and industrial projects must have an MPCA approved monitoring plan for each specific project.

Parameter Networks

The MPCA monitors different types of measurable properties called parameters. The group of sites where a parameter is monitored is referred to as a parameter network. Generally, parameters are pollutants such as fine particles or air toxics. However, parameters also include non-concentration data such as wind speed and temperature. Table 6 lists the types of parameters monitored by the MPCA along with the methods and equipment used.

The MPCA monitors the six criteria pollutants established by the 1970 Clean Air Act to show compliance with the NAAQS. The criteria pollutants are particulate matter ($PM_{2.5}$ and PM_{10}), lead, ozone, nitrogen dioxide, sulfur dioxide, and carbon monoxide.

Other types of particulate matter are also collected in Minnesota. Total suspended particulate matter (TSP) is monitored to show compliance with Minnesota Ambient Air Quality Standards (MAAQS). Chemical speciation of $PM_{2.5}$ is monitored at seven sites in Minnesota through the IMPROVE network and CSN. Speciation data are used for trends analysis and to better understand the sources of fine particles.

The MPCA also monitors pollutants that pose a potential risk to human health and the environment, but are not regulated by standards including air toxics, acid rain, and mercury. Air toxics include volatile organic compounds (VOCs), carbonyls, and metals. Acid rain and mercury are monitored through the NADP across Minnesota.

Compounds containing sulfur are also monitored since they may cause irritation to the eyes, nose, and throat. Hydrogen sulfide (H_2S) is monitored to show compliance with the MAAQS. Total reduced sulfur (TRS) contains H_2S; it is monitored around industrial sources and used as conservative measure to compare to the H_2S MAAQS.

Temperature, wind speed and direction, barometric pressure, and relative humidity strongly influence the concentrations and transport of pollutants. Meteorological data are collected at three sites in the Twin Cities metropolitan area. Meteorological data from other sources near air monitoring stations can also be used to interpret air quality monitoring data.

Generally, parameters are monitored continuously or as integrated data. Continuous data gives readings on a real time basis, in short increments such as every five or 15 minutes or every hour. Integrated samples are usually 24-hour averages. Integrated samples are collected daily, once every three days or once every six days. Continuous data are collected and analyzed at the site. For integrated data, samples are collected at sites and then transported to the lab for further analysis.

Tables 7 and 8 list all of the air quality monitoring sites in Minnesota and the parameters monitored at each.

Table 6: Methods and equipment

Monitoring parameter	Methods and equipment	Analyzing agency
Acid Deposition	Wet-only precipitation collection, Chromatography analysis	NADP
Black Carbon	Teledyne API Model 633	MPCA
Carbonyls	Liquid Chromatography – ATEC model 2200 sampler	MPCA
CO	Infrared Absorption – Teledyne API Models 300E/T300, Dasibi 3008	MPCA
CO trace level	Infrared Absorption – Teledyne API Model T300U	MPCA
Fibers	MDH Method 852 – TE-2000 TSP sampler	MDH
H_2S	Honeywell Analytics MDA model SPM Chemcassette	MPCA
Mercury Deposition	Wet-only precipitation collection, Inductively Coupled Argon Plasma analysis	NADP
Metals	Inductively Coupled Argon Plasma (ICP-OES) from TSP filters	MPCA
Meteorological Data	Various meteorological sensors	MPCA
NO/NO_y trace level	Chemiluminescence – Teledyne API Model T200U	MPCA
NO_X	Chemiluminescence – Teledyne API Models 200A/T200	MPCA
Ozone	Ultraviolet Absorption – Teledyne API Models 400E/ T400	MPCA
Particle sizer/counter	TSI Model 3031 Ultrafine Particle Monitor	MPCA
PM_{10}	Gravimetric – Andersen Hi-Vol samplers	MPCA
PM_{10} Continuous	Beta Attenuation – MetOne Instruments BAM-1020	MPCA
$PM_{10-2.5}$	Beta Attenuation – MetOne Instruments BAM-1020	MPCA
$PM_{2.5}$ Continuous	Beta Attenuation – MetOne Instruments BAM-1020	MPCA
$PM_{2.5}$ FEM	Beta Attenuation – MetOne Instruments BAM-1020 FEM	MPCA
$PM_{2.5}$ FRM	Gravimetric – Thermo Partisol-Plus model 2025 $PM_{2.5}$ Sequential Air Sampler	MPCA
$PM_{2.5}$ Speciation - CSN	Gravimetric, GC/MS, Ion Chromatography – MetOne Instruments SAAS Speciation Sampler; URG3000N Carbon Samplers	US EPA
$PM_{2.5}$ Speciation - IMPROVE	Gravimetric, GC/MS, Ion Chromatography – IMPROVE Speciation Sampler	IMPROVE
SO_2	Pulsed Fluorescence – Teledyne API Models 100E/T100	MPCA
SO_2 trace level	Pulsed Fluorescence – Teledyne API Model T100U	MPCA
TRS	SO_2 analyzer (pulsed fluorescence) with thermal oxidizer	MPCA
TSP	Gravimetric – Andersen Hi-Vol samplers	MPCA
VOCs	Gas Chromatography and Mass Spectrometry – ATEC model 2200 sampler	MPCA

Table 7: 2013 Site parameters - Greater Minnesota

MPCA Site ID	City Name	Site Name	$PM_{2.5}$ FRM	$PM_{2.5}$ FEM	$PM_{2.5}$ pre-FEM	$PM_{2.5}$ Speciation	PM_{10}	TSP and Metals	Ozone	Oxides of Nitrogen	Sulfur Dioxide	Carbon Monoxide	VOCs	Carbonyls	Other Parameters
MN08*	Hovland	Hovland													Acid Deposition
MN16*	Balsam Lake	Marcell													Acid and Hg Deposition
MN23*	Pillager	Camp Ripley													Acid and Hg Deposition
MN27*	Lamberton	Lamberton													Acid and Hg Deposition
MN28*	Sandstone	Grindstone Lake													Acid Deposition
MN32* VOYA1**	International Falls	Voyageurs				IMP									Acid Deposition
MN99*	Finland	Wolf Ridge													Acid Deposition
1300	Virginia	Virginia		X			X	X							
2013	Detroit Lakes	Detroit Lakes		X					X						
3051	Mille Lacs	Mille Lacs							X						PAHs
3052	Saint Cloud	Talahi School		X					X						
3053	Saint Cloud	Grede Foundries						X[L]							Hexavalent Chromium
3204	Brainerd	Brainerd Airport		X					X						
4210	Marshall	Marshall Airport		X					X						
5008	Rochester	Ben Franklin School	X	X		CSN			X						
5302	Stanton	Stanton Air Field							X						
7001 MN18* BOWA1**	Ely	Fernberg Road		X		IMP			X						Acid and Hg Deposition
7416	Cloquet	Cloquet							X						
7526	Duluth	Torrey Building										X			
7545	Duluth	Oneota Street					X								Collocated PM_{10}
7549	Duluth	Michigan Street											X	X	
7550	Duluth	WDSE	X						X						Collocated $PM_{2.5}$ FRM
7554	Duluth	Laura MacArthur School	X	X											
7555	Duluth	Waseca Road						X							Collocated TSP and metals
7810	Grand Portage	Grand Portage			X										
BLMO1**	Luverne	Blue Mounds				IMP									
GRRI1**	Winona	Great River Bluffs				IMP									

*NADP Site ID (no MPCA site ID exists)

**IMPROVE Site ID (no MPCA site ID exists and not an NADP site)

[L]Source-oriented Lead

Table 8: 2013 Site parameters - Twin Cities metropolitan area

MPCA Site ID	City Name	Site Name	$PM_{2.5}$ FRM	$PM_{2.5}$ FEM	$PM_{2.5}$ Speciation	PM_{10}	TSP and Metals	Ozone	Oxides of Nitrogen	Sulfur Dioxide	Carbon Monoxide	VOCs	Carbonyls	Other Parameters
250	St. Louis Park	St. Louis Park	X									X	X	
420	Rosemount	FHR 420					X		X	X	X	X	X	TRS, Meteorological Data
423	Rosemount	FHR 423							X	X	X	X	X	TRS, Meteorological Data
436	St. Paul Park	NTE 436								X		X	X	TRS, Collocated VOCs and Carbonyls
438	Newport	NTE 438					X					X	X	
442	Rosemount	FHR 442								X		X	X	
443	Rosemount	FHR 443								X		X	X	
446	Bayport	Point Road					X					X	X	
465	Eagan	Gopher Resources					X^{L}							Collocated TSP and Metals
470	Apple Valley	Apple Valley	X	X			X					X	X	
505	Shakopee	Shakopee	X					X						
861	St. Paul	Lexington Avenue									X			
866	St. Paul	Red Rock Road				X								Collocated PM_{10}
868	St. Paul	Ramsey Health Center	X			X^{C}						X	X	$^{C}PM_{10}$ Continuous, Fibers
871	St. Paul	Harding High School	X	X			X					X	X	Collocated $PM_{2.5}$ FRM and $PM_{2.5}$ FEM
907	Minneapolis	Humboldt Avenue					X					X	X	
909	Minneapolis	Pacific Street		X										Meteorological Data
954	Minneapolis	Arts Center								X	X			
961	Richfield	Richfield Intermediate School										X	X	
962	Minneapolis	Near-Road		X			X	X	X		X	X	X	Meteorological Data, Ultrafine Partilce Counter, Black Carbon, PAHs
963	Minneapolis	H.C. Andersen School	X	X	CSN		X					X	X	PAHs
966	Minneapolis	City of Lakes				X	X					X	X	Collocated VOCs and Carbonyls
3201	Saint Michael	Saint Michael		X				X						
6010	Blaine	Anoka Airport	X	X	CSN	X^{C}	X^{PL}	X	X^{T}	X^{T}	X^{T}	X	X	$^{C}PM_{10}$ Continuous, ^{T}NCore trace level gases, Hg Deposition, $PM_{10\text{-}2.5}$, and Meteorological Data
6012	East Bethel	Cedar Creek						X						Acid Deposition
6016	Marine on St. Croix	Marine on St. Croix						X						
6020	Federal Cartridge	Anoka					X^{L}							

^{L}Source-oriented Lead

^{PL}Population-oriented Lead

Criteria pollutants

In 1970, the Clean Air Act (CAA) established standards for six pollutants known to cause harm to human health and the environment. The CAA requires the MPCA to monitor these pollutants, called criteria pollutants, and report the findings to the EPA. The criteria pollutants are particulate matter, lead, ozone, nitrogen dioxide, sulfur dioxide, and carbon monoxide. For each of these pollutants the EPA has developed primary and secondary National Ambient Air Quality Standards (NAAQS). Primary standards are set to protect public health, while the secondary standard is set to protect the environment and public welfare (i.e. visibility, crops, animals, vegetation, and buildings).

The CAA requires the EPA to review the scientific basis of these standards every five years to ensure they are protective of public health and the environment. Table 9, found on the EPA website at http://epa.gov/air/criteria.html, describes the NAAQS (as of December 2012).

Table 9: National Ambient Air Quality Standards (NAAQS)

Pollutant [final rule cite]	Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide [76 FR 54294, Aug 31, 2011]	primary	8-hour	9 ppm	Not to be exceeded more than once per year
		1-hour	35 ppm	
Lead [73 FR 66964, Nov 12, 2008]	primary and secondary	Rolling 3 month average	0.15 $\mu g/m^3$ (1)	Not to be exceeded
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]	primary	1-hour	100 ppb	98th percentile, averaged over 3 years
	primary and secondary	Annual	53 ppb (2)	Annual Mean
Ozone [73 FR 16436, Mar 27, 2008]	primary and secondary	8-hour	0.075 ppm (3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution Dec 14, 2012 — $PM_{2.5}$	primary	Annual	12 $\mu g/m^3$	annual mean, averaged over 3 years
$PM_{2.5}$	secondary	Annual	15 $\mu g/m^3$	annual mean, averaged over 3 years
$PM_{2.5}$	primary and secondary	24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years
PM_{10}	primary and secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sept 14, 1973]	primary	1-hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

as of December 2012

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(2) The official level of the annual NO2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard (“anti-backsliding”). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

(4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Particulate matter

The MPCA monitors four different particle fractions: fine particulate matter ($PM_{2.5}$) which has an aerodynamic diameter of less than 2.5 microns, coarse particulate matter ($PM_{10-2.5}$) which has an aerodynamic diameter ranging from 2.5 to 10 microns, PM_{10} which has an aerodynamic diameter of less than 10 microns, and total suspended particulate matter (TSP) which includes the total mass of particles found in a sample of ambient air. $PM_{2.5}$ and PM_{10} are regulated by the NAAQS and TSP is regulated by the MAAQS.

Fine Particulate Matter ($PM_{2.5}$)

$PM_{2.5}$ is a chemically and physically diverse mixture of different sizes of very small particles most of which are smaller than 2.5 microns in diameter. It contains a complex mixture of chemicals including ammonium sulfate, ammonium nitrate, particle-bound water, elemental carbon, hundreds or thousands of organic compounds, and inorganic material including soil and metals.

$PM_{2.5}$ can be inhaled deeply into the lungs. Elevated concentrations of $PM_{2.5}$ are associated with a rise in heart attacks, acute and chronic bronchitis, asthma attacks, and respiratory symptoms. In children, reduced lung function growth and increased respiratory illness are also associated with elevated $PM_{2.5}$ concentrations.

There are currently 22 $PM_{2.5}$ sites in Minnesota, eight of which are in the Twin Cities metropolitan area. Figure 6 shows the locations of the sites in Minnesota. Five types of $PM_{2.5}$ monitors run in Minnesota: Federal Reference Method (FRM), Federal Equivalent Method (FEM), continuous, CSN, and IMPROVE.

The FRM monitors collect a 24-hour mass sample of $PM_{2.5}$ on Teflon filters. All FRM sites in Minnesota run once every three days. $PM_{2.5}$ data collected using this method are compared to the NAAQS to demonstrate compliance.

The FEM and continuous monitors are MetOne Instruments BAM-1020 (BAM) continuous mass monitors that collect and report hourly $PM_{2.5}$ concentrations. The hourly data are used to calculate the AQI and develop AQI forecasts for Minnesota. Continuous data are reported to the MPCA's AQI website and the EPA's AIRNow website (http://airnow.gov/) as well as the Air Quality System (AQS).

Data from the $PM_{2.5}$ FEM monitors, by definition, can be considered equivalent to the data from the FRM monitors and used to demonstrate attainment with the $PM_{2.5}$ NAAQS. Pre-FEM continuous monitors are used solely for reporting the AQI and for research. In 2012, the MPCA completed the process of upgrading pre-FEM continuous monitors to a version that the EPA has certified as an FEM. The Grand portage band of Lake Superior Chippewa is operating a pre-FEM continuous monitor in Grand Portage. Long-term, the MPCA also intends to minimize, to the extent possible, the use of $PM_{2.5}$ FRM monitors and use continuous $PM_{2.5}$ FEM monitors across the entire network.

CSN and IMPROVE monitors collect 24-hour samples once every three or six days that are analyzed for chemical composition. Data from the $PM_{2.5}$ speciation networks are used for trends analysis and to better understand sources of fine particles and health effects.

$PM_{2.5}$ regulatory network

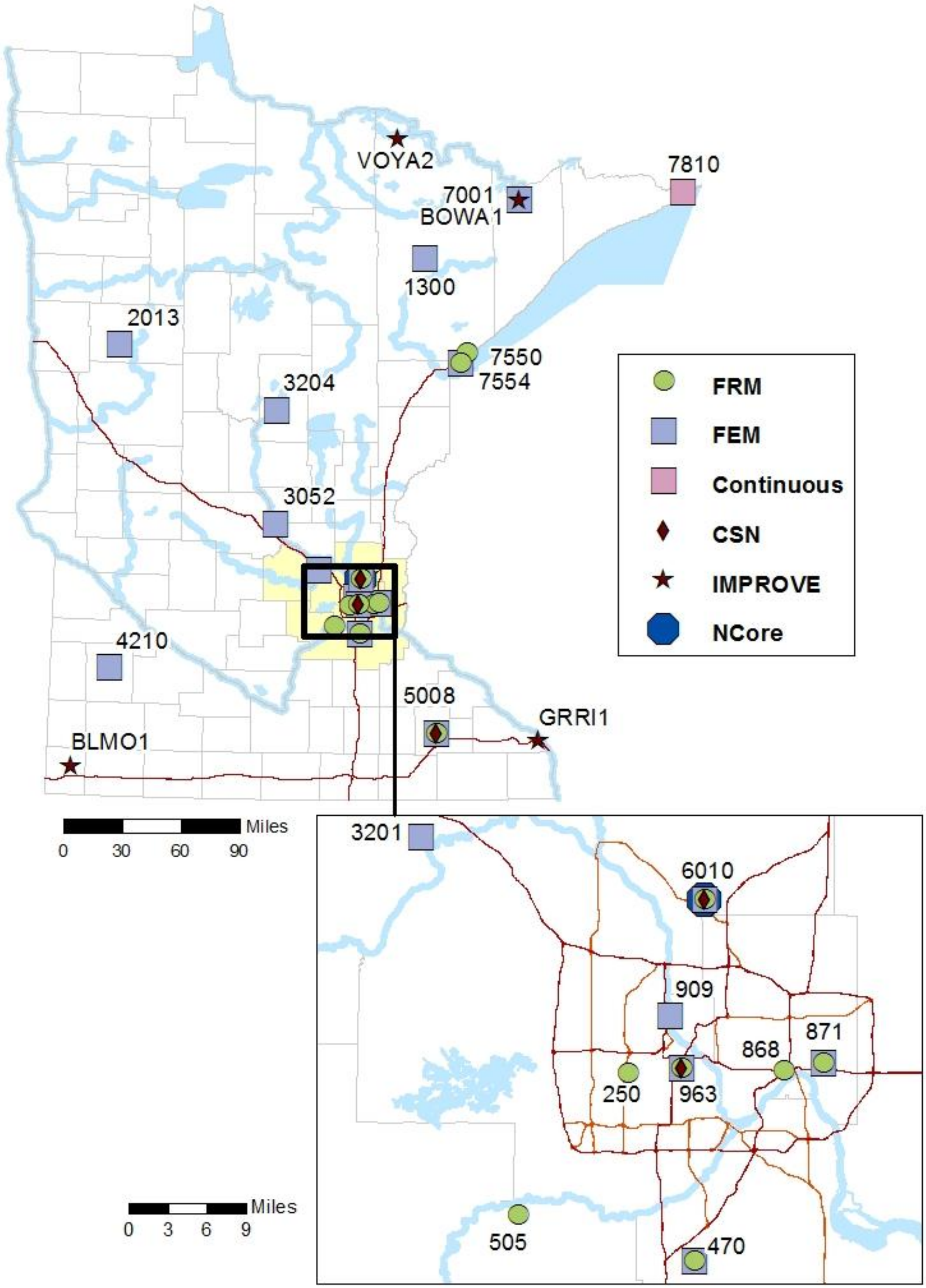
The $PM_{2.5}$ regulatory network includes FRM and FEM monitors. Currently the MPCA is operating ten FRM sites and 14 FEM sites. Long term, the MPCA intends to use continuous $PM_{2.5}$ FEM monitors across the network and minimize, to the extent possible, the use of $PM_{2.5}$ FRM monitors.

In summer 2013, a $PM_{2.5}$ FEM monitor will be added to the Near-road site (962) in Minneapolis. In 2014 the $PM_{2.5}$ FEM monitor in Minneapolis at Pacific Street (909) may move to a new site in North Minneapolis.

In response to new legislation, the MPCA will develop a process to identify locations in the Twin Cities to deploy an additional $PM_{2.5}$ FEM monitor for short-term monitoring. Monitoring may begin in 2013 as sites are located and equipment and infrastructure are in place and will continue in 2014.

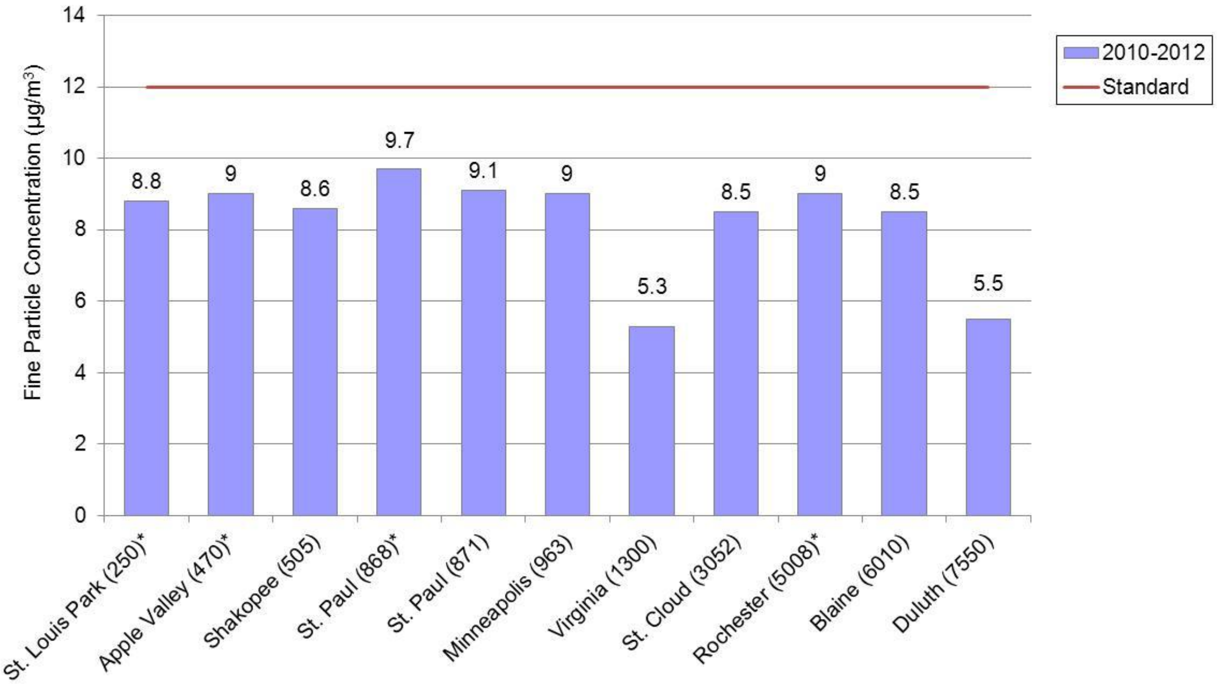
Minnesota does not spatially average $PM_{2.5}$ values from multiple sites to determine compliance with the annual $PM_{2.5}$ NAAQS. Instead each site is compared to the NAAQS individually. If a $PM_{2.5}$ FRM monitoring site were lost due to circumstances beyond the MPCA's control, a replacement site would be established if the lost site exceeded the NAAQS or if it is the "design value site" for a particular metropolitan statistical area (MSA). In this case, all possible efforts would be made to find a new site that is physically close to the lost site and has a similar scale and monitoring objective. However, if the "design value site" for that MSA is still operational, the MPCA would not establish a replacement site because the "design value site" would be used to determine compliance with the $PM_{2.5}$ NAAQS.

Figure 6: 2013 $PM_{2.5}$ monitoring sites in Minnesota



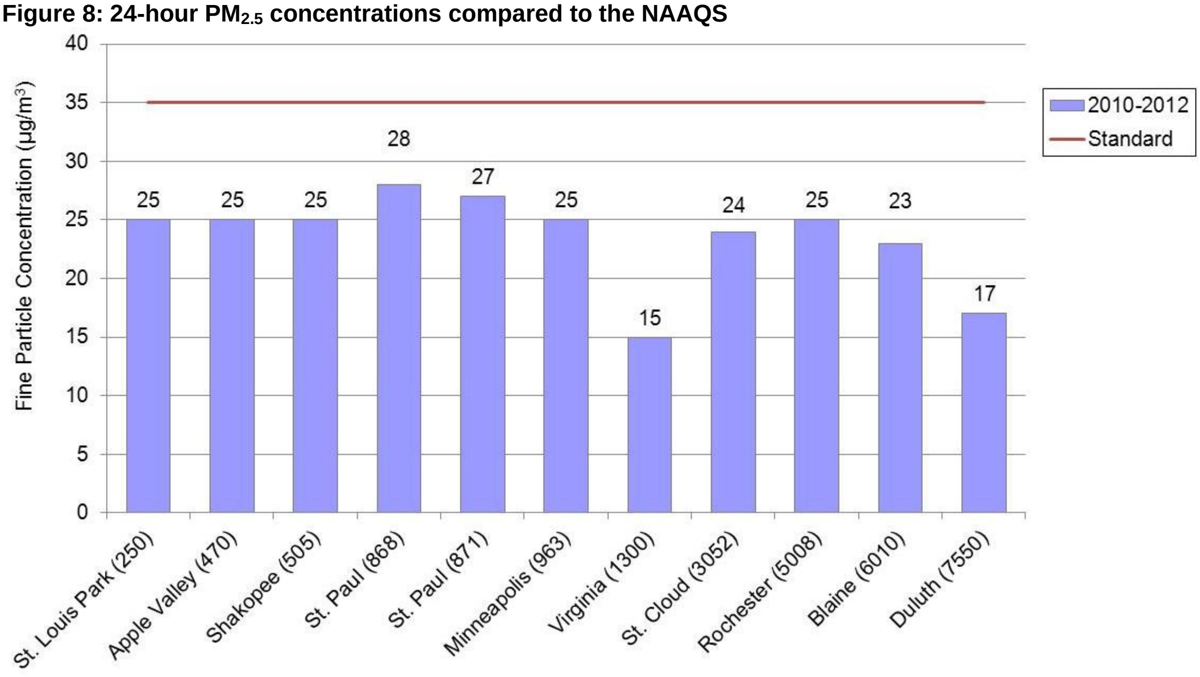
A monitoring site meets the annual $PM_{2.5}$ NAAQS if the three-year average of the annual average $PM_{2.5}$ concentration is less than or equal to 12 μg/m^3. Figure 7 shows the average of the 2010 through 2012 annual averages at Minnesota sites and compares them to the standard. Minnesota averages ranged from 5 μg/m^3 in Virginia (1300) to 10 μg/m^3 in St. Paul (868); therefore, all sites were below the annual standard.

Figure 7: Annual $PM_{2.5}$ concentrations compared to the NAAQS



A site meets the 24-hour standard if the 98th percentile of the 24-hour $PM_{2.5}$ concentrations in a year, averaged over three years, is less than or equal to 35 μg/m^3. Figure 8 shows the 2010 through 2012 98th percentile of the daily averages at Minnesota sites and compares them to the standard. Minnesota averages ranged from 15 μg/m^3 in Virginia (1300) to 28 μg/m^3 in St. Paul (868); therefore, all sites were below the 24-hour standard.

Figure 8: 24-hour $PM_{2.5}$ concentrations compared to the NAAQS



* The monitoring site did not meet the minimum completeness criteria for design value calculations. A site meets the completeness requirement if 75% of required sampling days are valid for each calendar quarter included in the design value calculation.

$PM_{2.5}$ continuous network

The MPCA currently operates 14 FEM continuous monitors $PM_{2.5}$ sites in Minnesota. All FEM sites became operational in 2011 and 2012. There is also a pre-FEM monitor at Grand Portage (7810) which is owned by the Grand Portage Band of Lake Superior Chippewa. As discussed in the $PM_{2.5}$ regulatory network, two $PM_{2.5}$ FEM monitors will be added in summer 2013 and one may move in 2014.

The $PM_{2.5}$ continuous data provides two key types of information that are not available from the FRM network. Continuous data capture high concentration days that might be missed in the one in three day FRM sampling schedule. Daily monitoring also allows for temporal comparisons between sites on an ongoing basis, providing better comparisons. In addition, continuous $PM_{2.5}$ monitoring provides hourly data that assists in understanding how concentrations vary throughout the day. Understanding these daily fluctuations helps determine sources of $PM_{2.5}$ and when health risks from fine particles are greatest. This increased understanding of concentrations and risks aids in prioritizing emission reduction efforts.

Figure 9 shows daily $PM_{2.5}$ concentrations from seven BAM monitors across Minnesota. This chart illustrates how continuous data show the variability between sites. $PM_{2.5}$ is a regional pollutant with some addition from local sources; therefore, concentrations tend to rise and fall in unison across the state. The differences in concentrations between sites tend to be driven by local sources and closer proximity to large $PM_{2.5}$ sources to the south. The difference between urban and rural areas demonstrates the affect of man-made sources on fine particulate concentrations.

Figure 9: $PM_{2.5}$ daily concentrations in January 2012

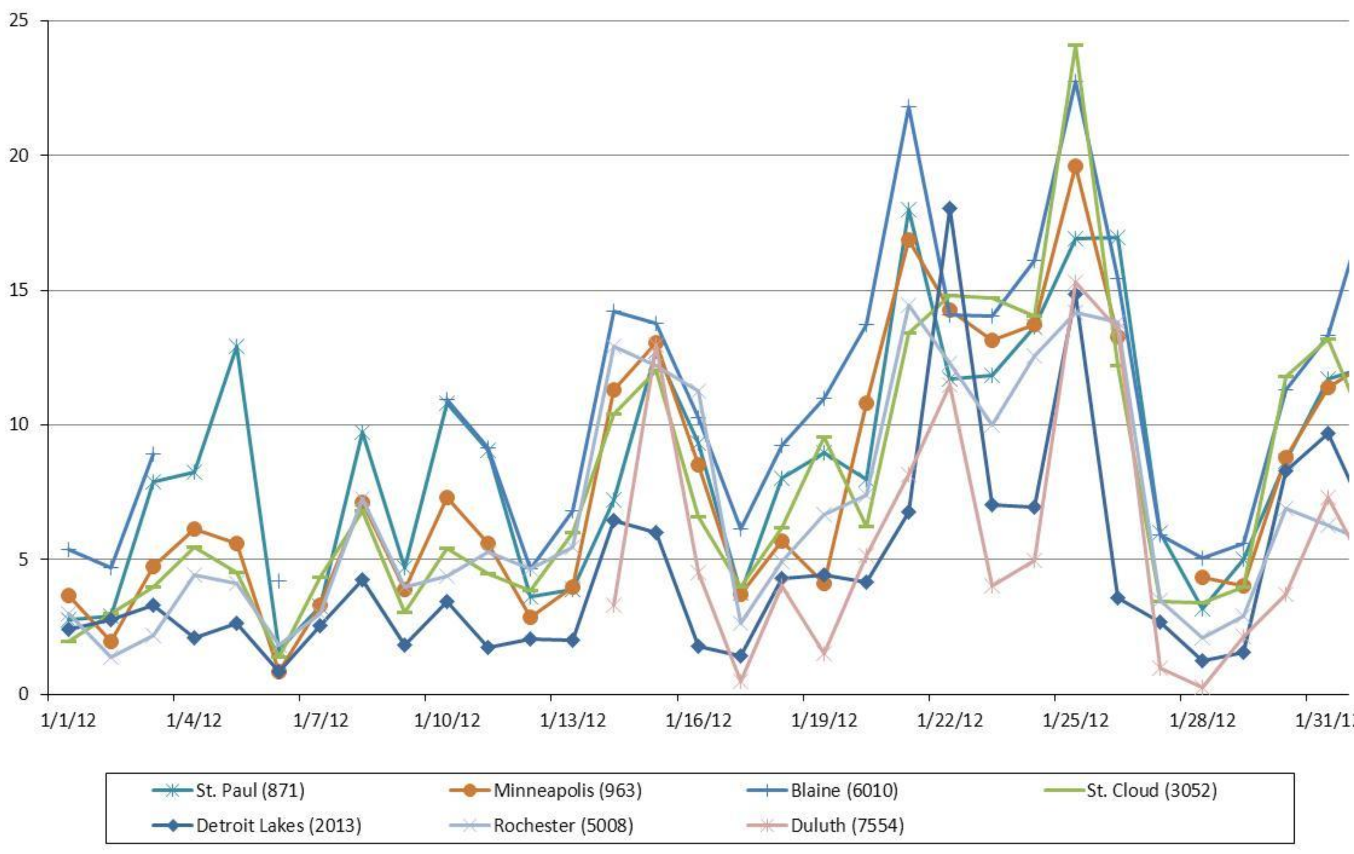
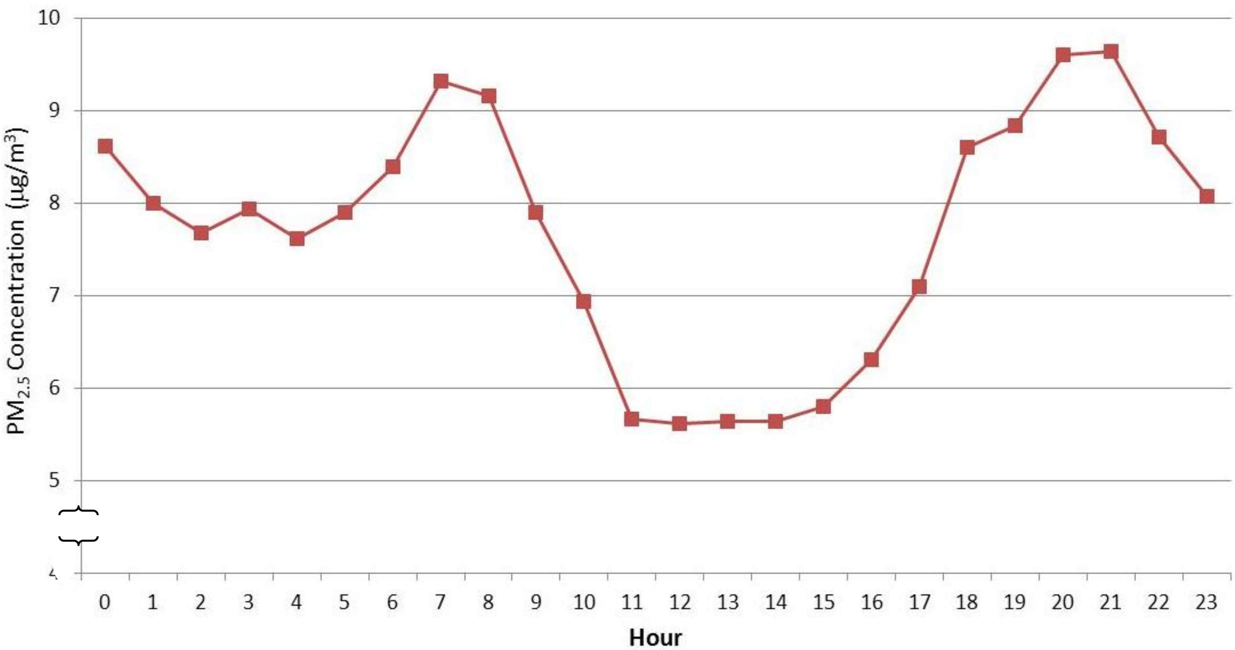


Figure 10 shows the average hourly concentrations in January 2012 in Minneapolis (site 963). It shows a classic traffic pattern in an urban area. The peak concentration around 7:00 a.m. results from rush hour traffic. As temperatures rise in the day, the atmospheric mixing height increases. This allows for dilution of fine particle concentrations and lowered concentrations in the afternoon. Temperatures fall in the evening, lowering the mixing height and trapping the particles, including those emitted during evening rush hour. This results in elevated concentrations throughout the night.

Figure10: $PM_{2.5}$ average hourly concentrations at Andersen School (963) in January 2012



$PM_{2.5}$ Speciation

Currently, seven monitors measure $PM_{2.5}$ chemical speciation in Minnesota. Figure 1 shows the locations of the sites in Minnesota. The monitors in Minneapolis (963), Blaine (6010), and Rochester (5008) are part of the EPA's Chemical Speciation Network (http://www.epa.gov/ttn/amtic/speciepg.html) which focuses on urban locations. The monitors at Voyageurs (VOYA2), Ely (BOWA1), Blue Mounds (BLMO1), and Great River Bluffs (GRRI1) are part of the IMPROVE network (http://vista.cira.colostate.edu/IMPROVE/) which focuses on visibility issues primarily in rural locations. Sampling frequency for these sites is once every three days except Rochester (5008) where sampling is done once every six days. Samples are analyzed at contract labs selected by the EPA and the IMPROVE program.

The particulate monitoring portion of the IMPROVE program measures $PM_{2.5}$ for mass, optical absorption, major and trace elements, organic and elemental carbon, and nitrate. CSN monitoring is similar except that it also includes analysis for ammonium and does not include optical absorption. In order to make the CSN data more comparable to the IMPROVE data, URG3000N carbon samplers were added to the CSN network over the last few years. Minneapolis (963) started sampling with a URG3000N carbon sampler on May 3, 2007 and Rochester (5008) started on October 4, 2009. On January 1, 2011 a CSN speciation monitor was added to the NCore site in Blaine (6010). No changes are expected in 2014.

Coarse Particulate Matter ($PM_{10-2.5}$)

The 2006 Ambient Air Monitoring Regulations contain a requirement for $PM_{10-2.5}$ mass and speciation monitoring to be conducted at NCore multipollutant monitoring sites. The collocation of both $PM_{10-2.5}$ and $PM_{2.5}$ speciation monitoring at NCore sites is consistent with the multipollutant objectives of the NCore network and will support further research in understanding the chemical composition and sources of PM_{10}, $PM_{10-2.5,}$ and $PM_{2.5}$ at a variety of urban and rural locations. This additional data will inform future regulation, providing more targeted protection from the health effects associated with coarse particles.

The MPCA started monitoring $PM_{10-2.5}$ at the NCore site in Blaine (6010) in the beginning of 2011. No additional sites are expected at this time.

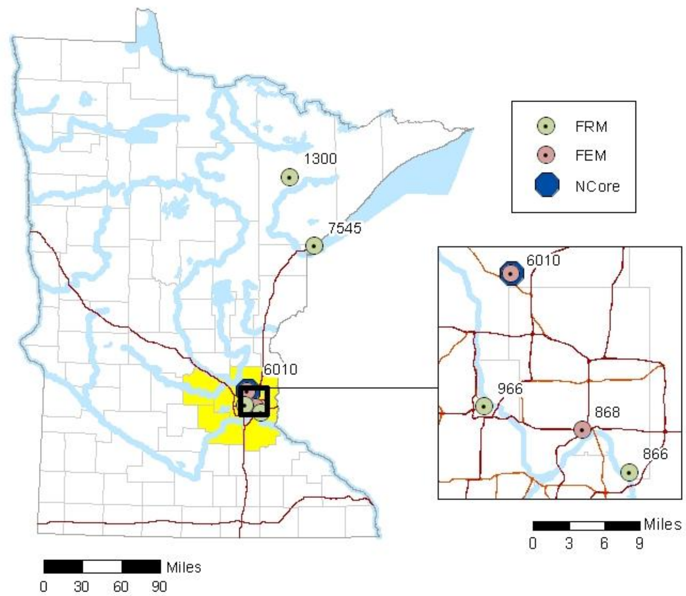
PM_{10}

PM_{10} includes all particles with an aerodynamic diameter less than 10 microns. Short-term exposure to PM_{10} is linked to hospitalization and even premature death in people with heart or lung disease. Decreased lung function and increased respiratory symptoms in children are also associated with PM_{10} exposure.

The MPCA currently operates four PM_{10} Federal Reference Method (FRM) monitors. This method collects mass samples of PM_{10} over a 24-hour period once every six days. There are also continuous FEM PM_{10} monitors in St. Paul (868) and Blaine (6010). Figure 11 shows the locations of the PM_{10} monitors in Minnesota in 2013. The majority of the PM_{10} monitors are located in the Twin Cities metropolitan area with additional monitors in Duluth (7545) and Virginia (1300). No changes are expected in 2014.

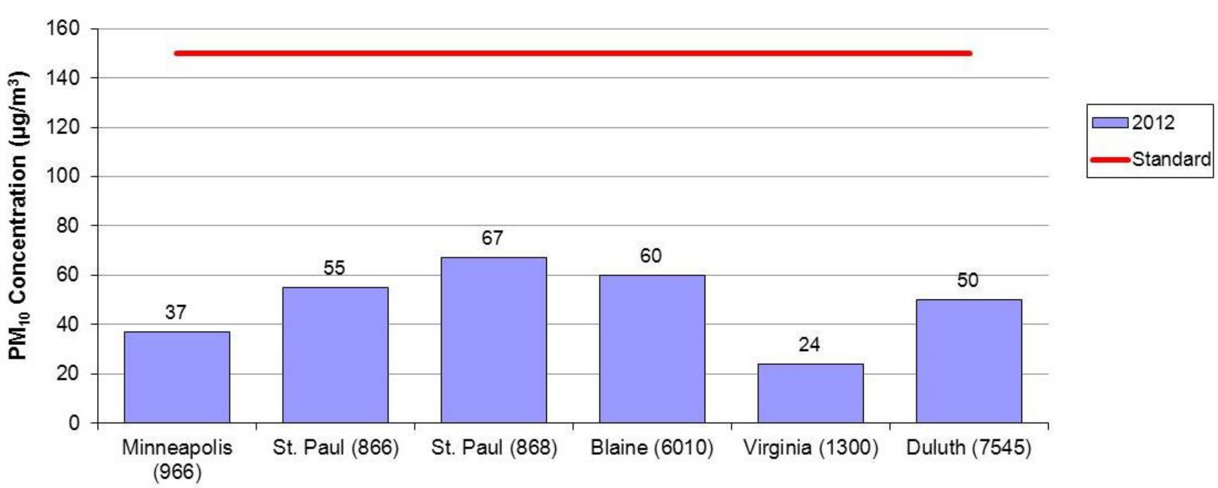
The long-term goal is to use continuous PM_{10} FEM monitors across the entire network and eliminate, to the extent possible, the use of the filter based PM_{10} FRM monitors. Continuous monitors capture more data and reduce operational costs associated with weighing, deploying, and recovering filters from the network.

Figure 11: 2013 PM_{10} monitoring sites in Minnesota



Minnesota currently meets applicable NAAQS for PM_{10} at all sites. A monitoring site meets the 24-hour PM_{10} NAAQS when the level of 150 $\mu g/m^3$ is not exceeded more than once per year. Figure 12 shows the 2012 second highest daily maximums at Minnesota sites and compares them to the standard. The Minnesota values ranged from 24 $\mu g/m^3$ in Virginia (1300) to 67 $\mu g/m^3$ in St. Paul (868); therefore, all sites were below the 24-hour standard in 2012. There is no annual standard for PM_{10}.

Figure 12: 24-hour PM_{10} concentrations compared to the NAAQS



Total Suspended Particulate Matter (TSP)

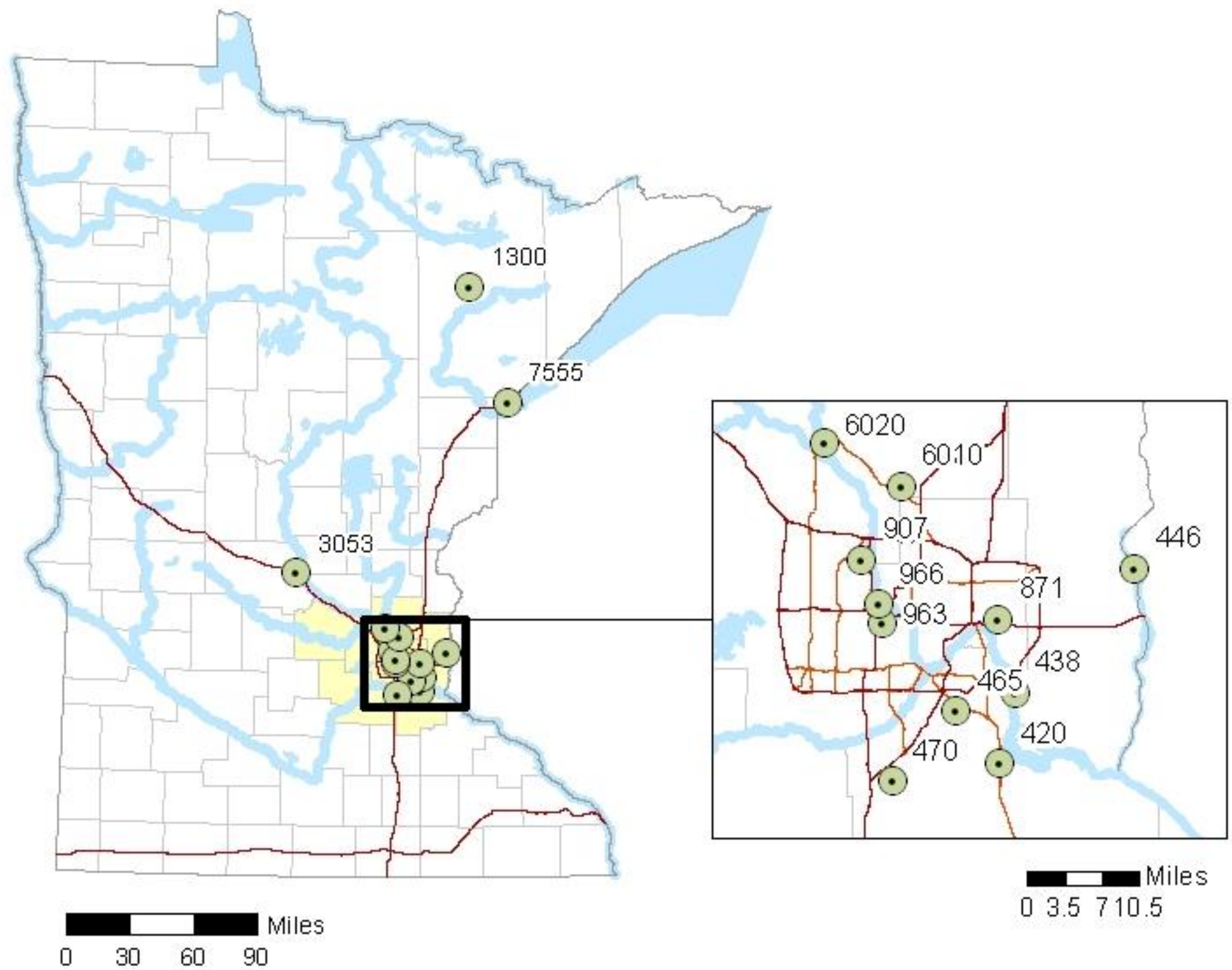
TSP includes the total number of particles of solid or liquid matter - such as soot, dust, aerosols, fumes, and mist - found in a sample of ambient air. TSP was one of the original NAAQS; however, it was replaced in 1987 by the PM_{10} standard at the national level. Generally, more health effects are expected from smaller particles such as PM_{10} and $PM_{2.5}$. Today, TSP levels are regulated by the MAAQS in Minnesota.

The MPCA currently operates 14 TSP monitoring sites. Figure 13 shows the location of the existing sites in Minnesota. Mass samples of TSP are collected over a 24 hour period once every six days. TSP filters are also extracted and analyzed using Inductively Coupled Argon Plasma (ICAP) for metals as part of the air toxics program. Metals are discussed further in the air toxics section of this report.

Pending EPA approval, the MPCA intends to shut down TSP sites in Anoka (6020) and St. Cloud (3053) in July 2013. These two sites are source-oriented lead monitoring sites and monitoring data suggests that ambient lead concentrations are well below 50 percent of the lead NAAQS.

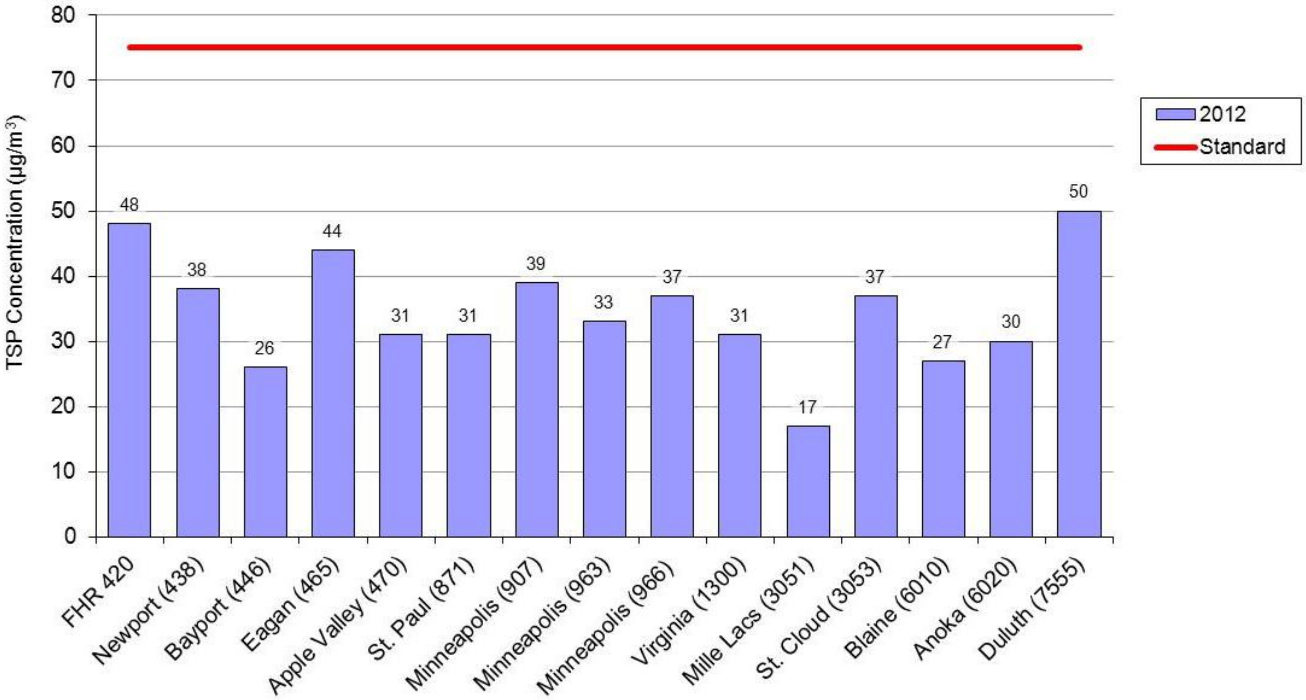
In summer 2013, a TSP monitor will be added to the Near-Road site (962) in Minneapolis. Also, in response to new legislation, the MPCA will develop a process to identify locations in the Twin Cities to deploy an additional TSP and metals monitor for short-term monitoring. Monitoring may begin in 2013 as sites are located and equipment and infrastructure are in place and will continue in 2014.

Figure 13: 2013 TSP monitoring sites in Minnesota



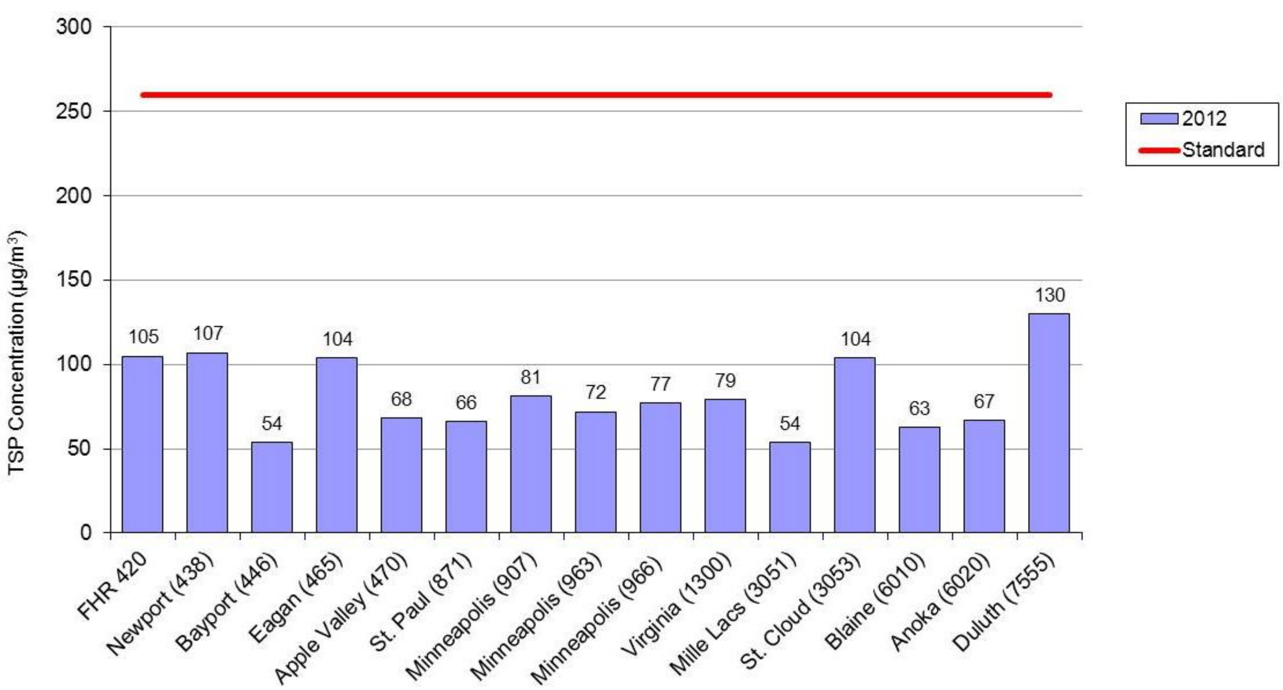
Minnesota currently meets applicable MAAQS for TSP. A monitoring site meets the annual TSP standard if the annual geometric average is less than or equal to 75 µg/m^3. Figure 14 shows the 2012 annual averages at Minnesota sites and compares them to the standard. Minnesota averages ranged from 17 µg/m^3 in Mille Lacs (3051) to 50 µg/m^3 in Duluth (7555); therefore, all sites were below the annual standard in 2012.

Figure 14: Annual average TSP concentrations compared to the MAAQS



A monitoring site meets the 24-hour standard when the level of 260 µg/m^3 is not exceeded more than once per year. Figure 15 shows the 2012 second highest daily maximums at Minnesota sites and compares them to the standard. Minnesota values ranged from 54 µg/m^3 in Mille Lacs (3051) and Bayport (54) to 130 µg/m^3 in Duluth (7555); therefore, all sites were below the 24-hour standard in 2012.

Figure 15: 24-hour TSP concentrations compared to the MAAQS



Lead (Pb)

Lead is a metal found naturally in the environment as well as in manufactured products. Since lead was phased out of gasoline, air emissions and ambient air concentrations have decreased dramatically. Currently, metals processing facilities (lead and other metals smelters) and leaded aviation fuel are the primary sources of lead emissions.

Lead emitted into the air can be inhaled directly or ingested after it settles onto surfaces or soils. Scientific evidence about the health effects of lead has expanded significantly in the last 30 years. Exposures to low levels of lead early in life have been linked to effects on IQ, learning, memory, and behavior. There is no known safe level of lead in the body.

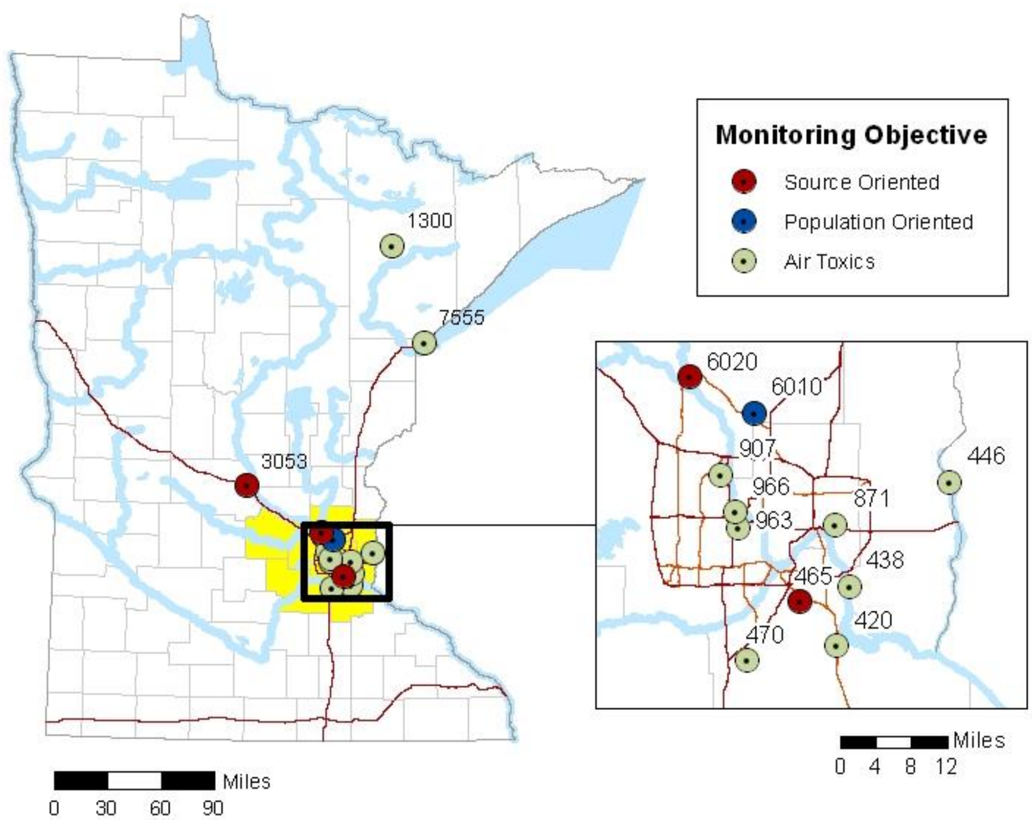
Elevated lead levels are also detrimental to animals and to the environment. Ecosystems near sources of lead show many adverse effects including losses in biodiversity, changes in community composition, decreased growth and reproductive rates in plants and animals, and neurological effects in animals.

The MPCA monitors lead at 14 sites across the state; including the three source-oriented monitoring sites in Eagan (465), St. Cloud (3053) and Anoka (6020); one population-oriented site at NCore in Blaine (6010); and all sites where TSP is collected as part of the Air Toxics Program metals analysis. Figure 16 shows the locations where lead is monitored in 2013.

As part of the 2008 NAAQS revision for lead, the EPA expanded the existing lead monitoring network. On December 14, 2010 the EPA finalized revisions to the lead monitoring requirements, requiring monitoring near sources with lead emissions equal to or greater than 0.5 tons per year (tpy), and requiring that all urban NCore sites include lead monitoring. In 2010, The MPCA began operations of a new source-oriented lead monitoring network, which includes an existing lead site at Gopher Resources in Eagan (465), and new sites in Anoka (6020) and St. Cloud (3053). Monitoring results from the source-oriented sites in Anoka and St. Cloud indicate that lead concentrations are less than 50 percent of the lead NAAQS. Therefore, following the completion of three years of monitoring and pending EPA approval, the MPCA intends to close the Anoka and St. Cloud lead monitoring sites in July 2013.

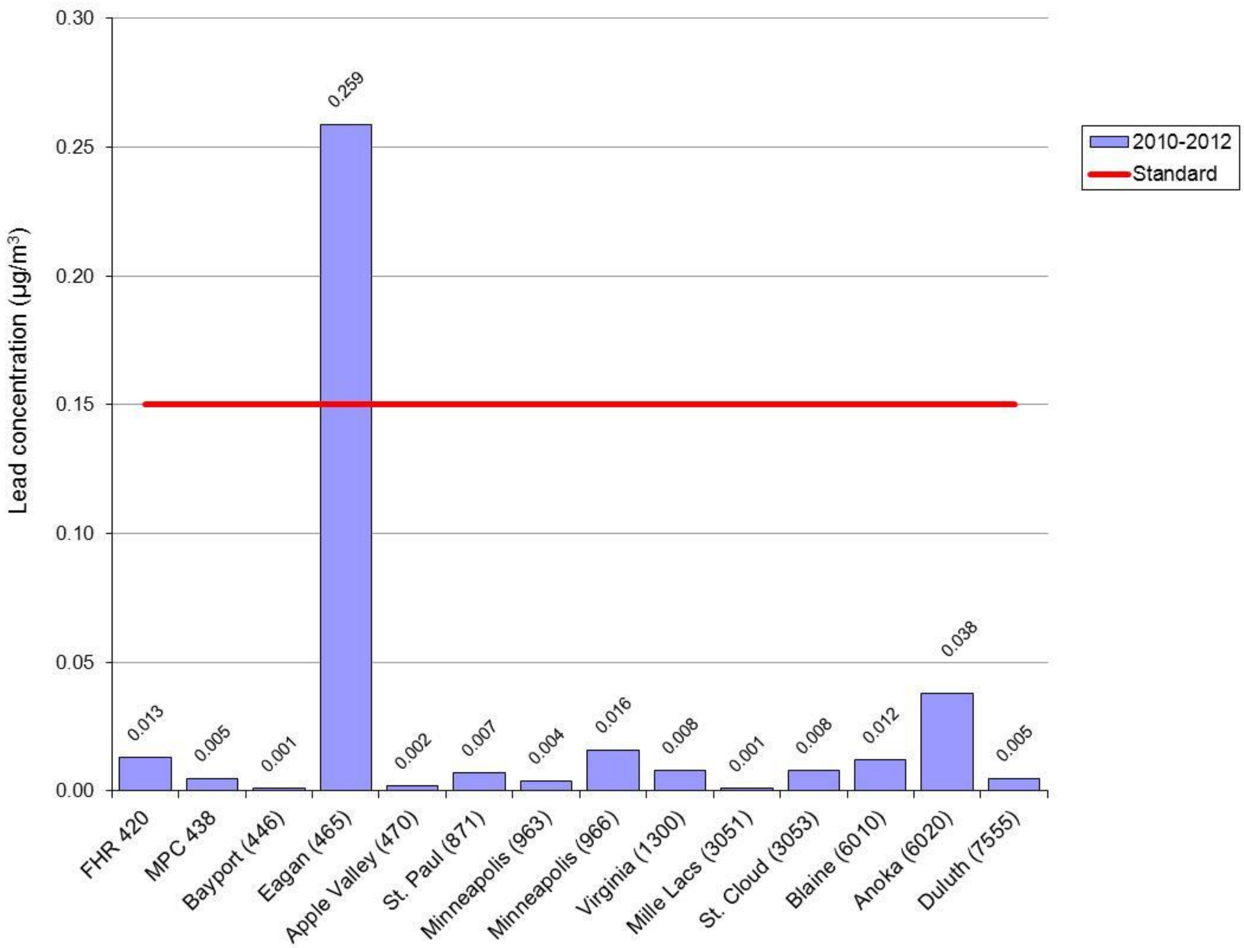
As discussed in the TSP section, the MPCA also intends to start monitoring lead at the Near-Road site (962) and at a short-term monitoring site in the Twin Cities metropolitan area.

Figure 16: 2013 Lead monitoring sites in Minnesota



With the exception of the site located near Gopher Resource Corporation in Eagan (465), existing lead monitoring sites in Minnesota meet the 2008 lead NAAQS of 0.15 µg/m^3. Figure 17 shows the 3-year maximum rolling quarter average concentration at monitored sites from 2010-2012. Minnesota values range from 0.001µg/m^3 in Mille Lacs (3051) and Bayport (446) to 0.259 µg/m^3 in Eagan (465) with the majority of sites below 0.02 µg/m^3.

Figure 17: Lead concentrations compared to the NAAQS



Ozone (O_3)

Ozone is an odorless, colorless gas composed of three atoms of oxygen. Ground-level ozone is not emitted directly into the air, but is created through a reaction of nitrogen oxides and volatile organic compounds in the presence of sunlight.

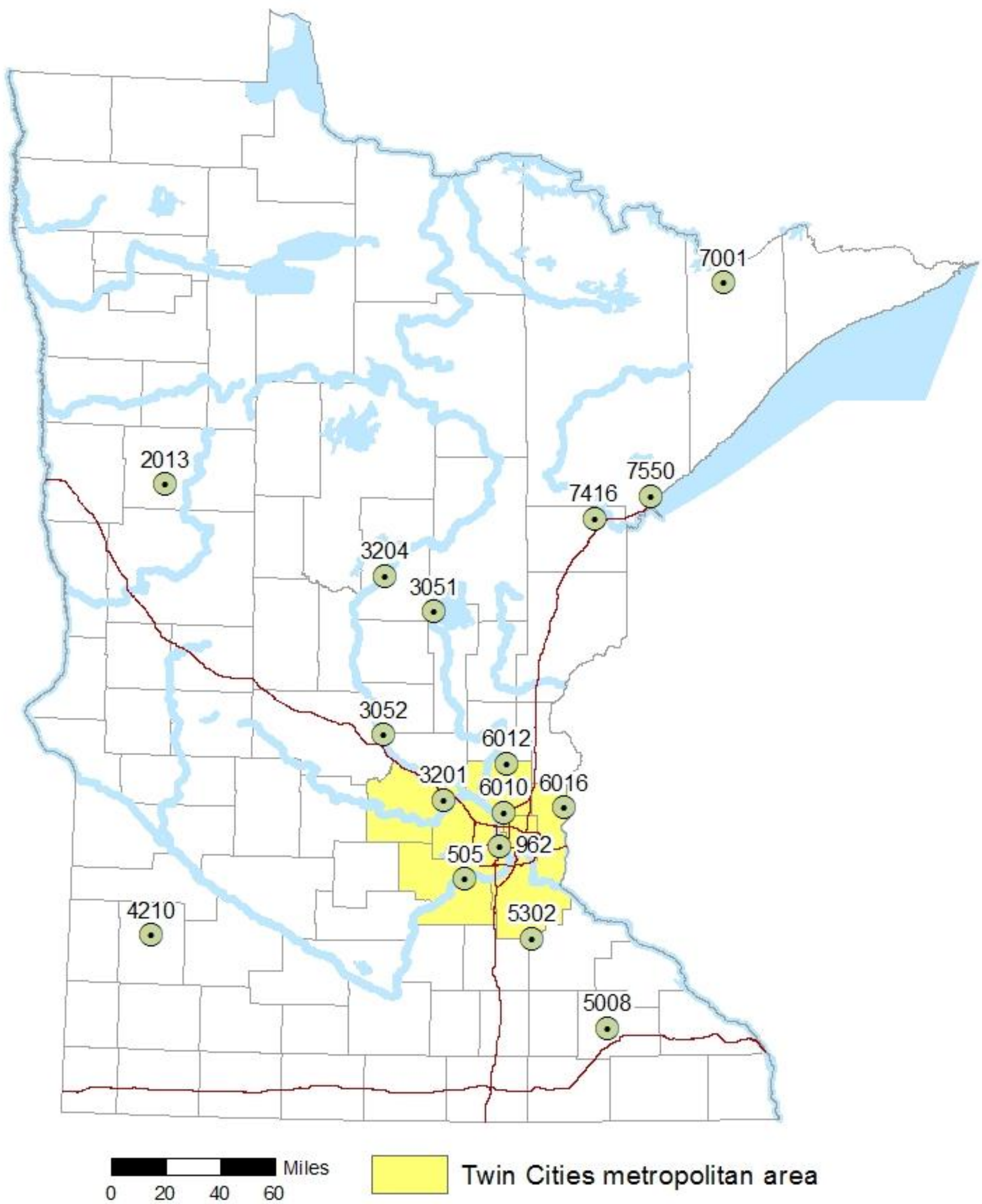
Breathing air containing ozone can reduce lung function and inflame airways, which can increase respiratory symptoms and aggravate asthma or other lung diseases. Ozone exposure has also been associated with increased susceptibility to respiratory infections, medication use, doctor and emergency department visits and hospital admissions for individuals with lung disease. Ozone exposure also increases the risk of premature death from heart and lung disease. Children are at increased risk from ozone because their lungs are still developing and they are more likely to have increased exposure since they are often active outdoors.

In addition, cumulative ozone exposure can lead to reduced tree growth; visibly injured leaves and increased susceptibility to disease, damage from insects and harsh weather. These effects can have adverse impacts on ecosystems, including loss of species and changes to habitat quality, and water and nutrient cycles.

Ozone is monitored on a continuous basis at 16 monitoring sites and is reported in hourly increments. Because ozone formation requires high temperatures and sunny conditions, the EPA only requires Minnesota to monitor for ozone from April 1 – October 31 each year. The majority of ozone sites in Minnesota follow this monitoring season; however, ozone is measured year round at the NCore site in Blaine. The data collected from these ozone monitors are used to determine compliance with the NAAQS and are reported as part of the AQI. Figure 18 shows the locations of the ozone sites in Minnesota. An additional ozone monitor, located at Voyageurs National Park, is operated by the National Park Service. Since the MPCA does not have any role in this monitor, it is not included in our ozone or AQI monitoring networks.

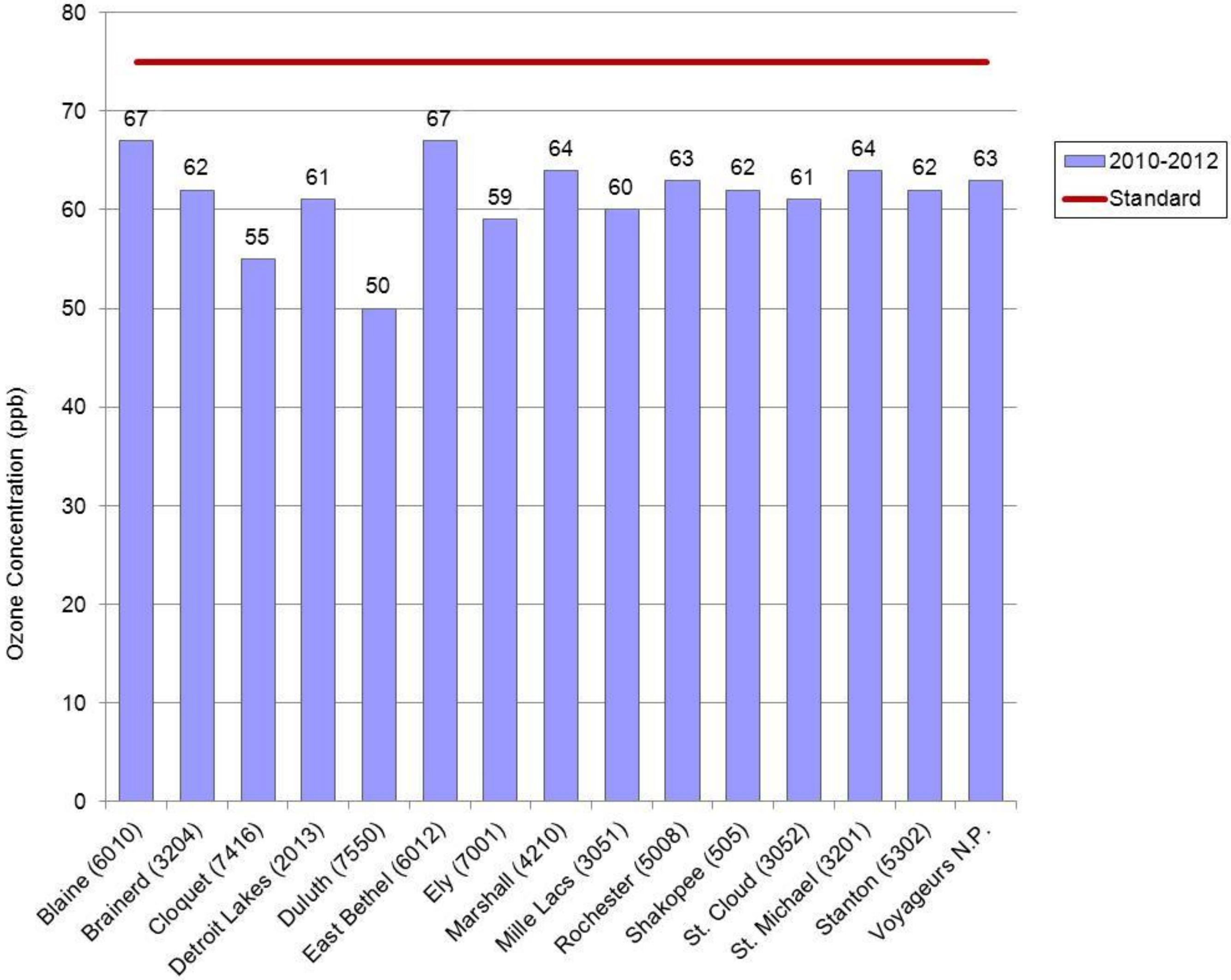
No changes are expected in ozone monitoring in 2014.

Figure 18: 2013 Ozone monitoring sites in Minnesota



A monitoring site meets the primary ozone NAAQS if the three year average of the fourth highest daily maximum 8-hour concentration is less than or equal to 75 ppb. Figure 19 shows the 2010 through 2012 8-hour averages at Minnesota sites and compares them to the standard. Minnesota averages ranged from 50 ppb in Duluth (7550) to 67 ppb in Blaine (6010) and East Bethel (6012); therefore, all sites were below the 8-hour standard.

Figure 19: 8-hour average ozone concentrations compared to the NAAQS



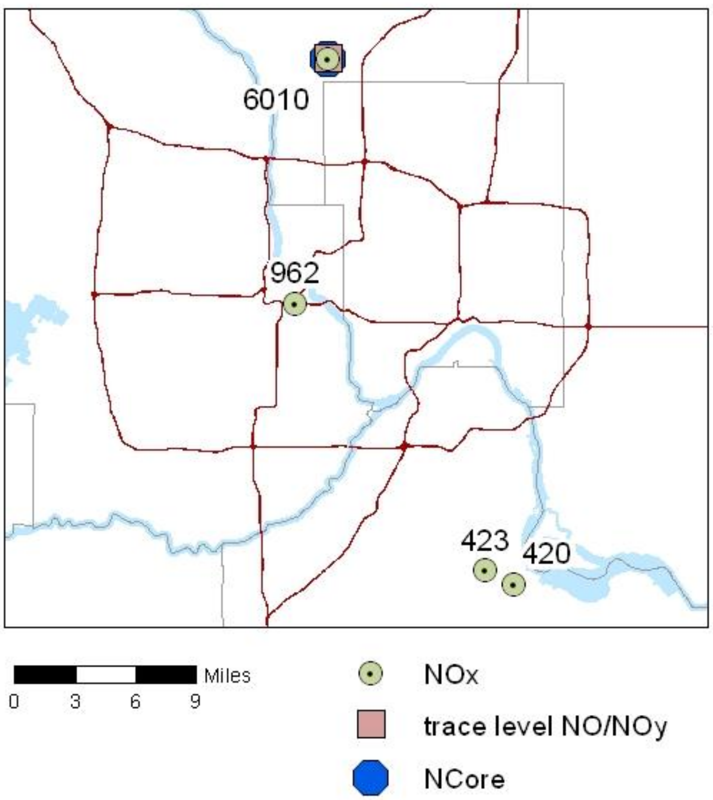
Oxides of Nitrogen (NO_X)

NO_X is the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. The two primary components are nitric oxide (NO) and nitrogen dioxide (NO_2). NO_2 is the regulated pollutant; it can often be seen as a reddish-brown layer in urban areas.

NO_X contribute to a wide range of health and environmental effects. NO_2 itself can irritate the lungs and lower resistance to respiratory infections. More importantly, nitrogen oxides react to form ground–level ozone, $PM_{2.5}$, acid rain and other toxic chemicals. They also can lead to visibility and water quality impairment due to increased nitrogen loading in water bodies. In addition, nitrous oxide, another component of NO_x, is a greenhouse gas that contributes to climate change.

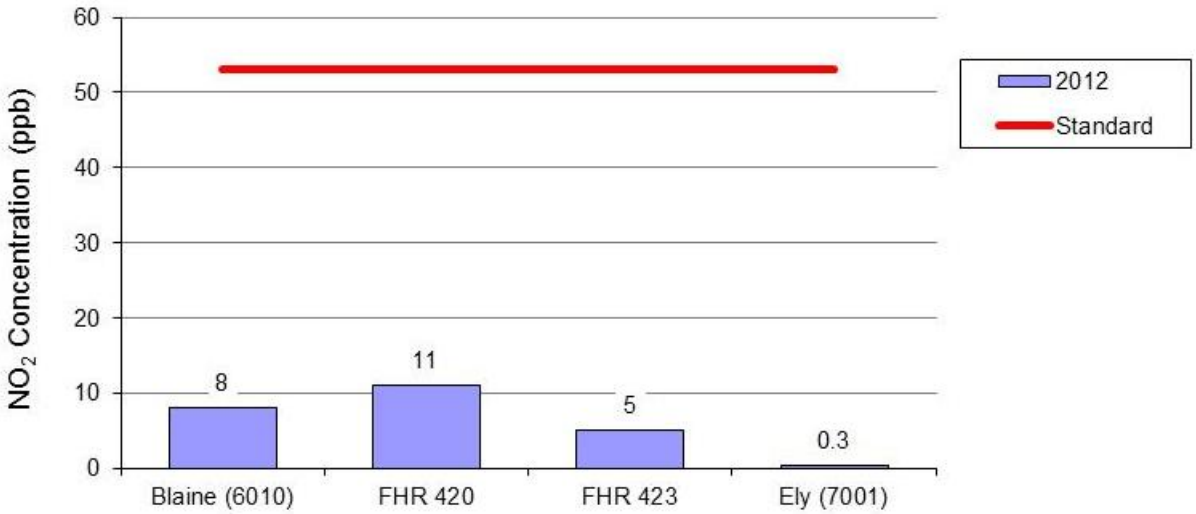
Currently, the MPCA monitors NO_2 and NO at four sites in the Twin Cities metropolitan area (figure 20). An additional NO_X monitor ran in Ely (7001) through March 2013 to complete a one year assessment. The data from this site will be used for a variety of modeling validation projects. Trace level NO/NO_y has been at the NCore site in Blaine (6010) since 2009. This trace level data will help us understand the role of these pollutants at levels far below the NAAQS; however, due to performance issues with the monitoring equipment, trace level monitoring results have been unreliable. The MPCA is replacing the trace level monitoring instruments in the summer of 2013. No changes are expected in 2014.

Figure 20: 2013 NO_X monitoring sites in the Twin Cities metropolitan area



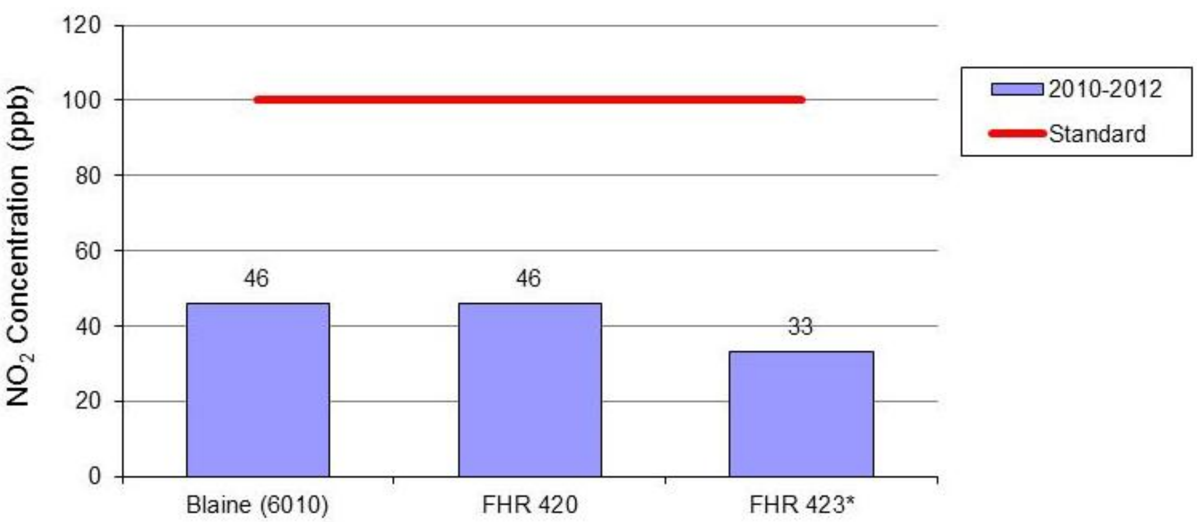
A monitoring site meets the annual NAAQS for NO_2 if the annual average is less than or equal to 53 ppb. Figure 21 shows the 2012 averages at Minnesota sites and compares them to the standard. Minnesota averages ranged from 0.3 ppb in Ely (7001) to 11 ppb at FHR 420; therefore, Minnesota currently meets the annual NAAQS for NO_2.

Figure 21: Annual Average NO_2 Concentrations compared to the NAAQS



On January 22, 2010 the EPA finalized revisions to the NO_2 NAAQS. As part of the standard review process, the EPA retained the existing annual NO_2 NAAQS, but also created a new 1-hour standard. This new 1-hour NAAQS will protect against adverse health effects associated with short term exposures to elevated NO_2. To meet this standard, the three-year average of the annual 98th percentile daily maximum 1-hour NO_2 concentration must not exceed 100 ppb. Figure 22 shows the 2010-2012 average of the annual 98th percentile daily maximum 1-hour NO_2 concentrations at Minnesota sites and compares them to the 1-hour standard. Minnesota averages ranged from 33 ppb at FHR 423 to 46 ppb at FHR 420 and in Blaine (6010); therefore, all Minnesota sites currently meet the1-hour NAAQS for NO_2.

Figure 22: 1-hour NO_2 concentrations compared to the NAAQS



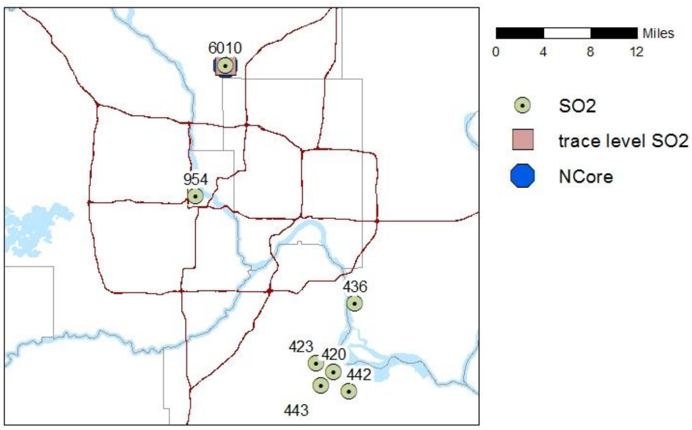
* The monitoring site did not meet the minimum completeness criteria for design value calculations. A site meets the completeness requirement if 75% of required sampling days are valid for each calendar quarter included in the design value calculation. NO_2 at Ely (7001) was part of a one year assessment and not intended to collect 3 years of data for design value calculations.

Sulfur Dioxide (SO_2)

SO_2 belongs to the family of sulfur oxide gases. SO_2 reacts with other chemicals in the air to form sulfate particles. Exposures to SO_2, sulfate aerosols, and fine particles contribute to respiratory illness, and aggravate existing heart and lung diseases. High levels of SO_2 emitted over a short period, such as a day, can be particularly problematic for people with asthma. SO_2 also contributes to the formation of $PM_{2.5}$, visibility impairment, and acid rain. SO_2 is monitored on a continuous basis and reported in hourly increments. Data are used to determine compliance with the NAAQS and are reported as part of the AQI. Minnesota currently meets all applicable NAAQS for SO_2; however, continued reductions are sought due to its role in forming fine particles.

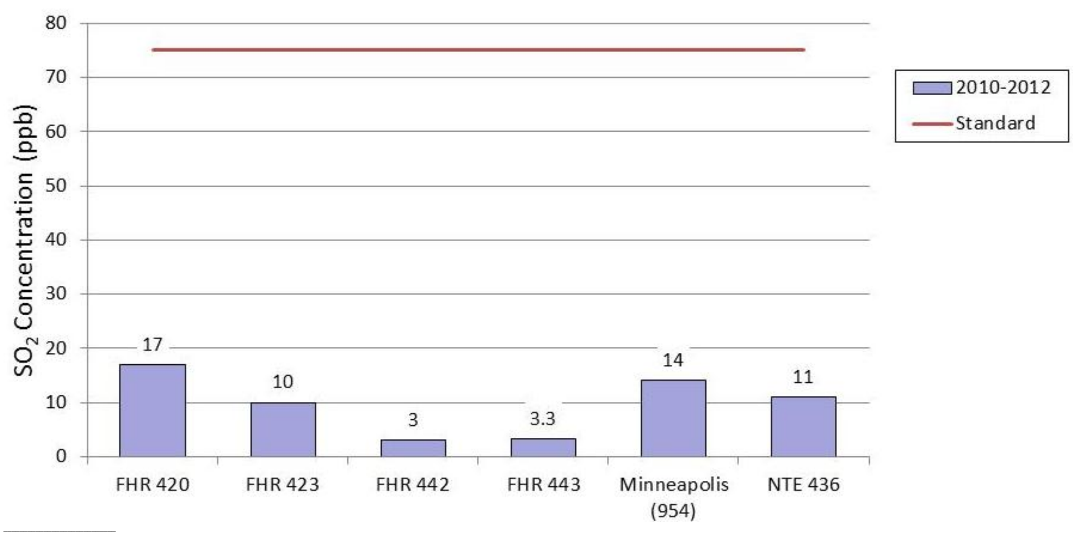
The MPCA monitors SO_2 at eight sites in the Twin Cities metropolitan area shown in Figure 23. An additional SO_2 monitor ran in Ely (7001) through March 2013 to complete a one year assessment. The data from this site will be used for a variety of modeling validation projects. Trace level SO_2 has been at the NCore site in Blaine (6010) since 2009. This trace level data will help us understand the role of SO_2 at levels far below the NAAQS; however, due to performance issues with the monitoring equipment, trace level monitoring results have been unreliable. The MPCA is replacing the trace level monitoring instruments in the summer of 2013. No changes are expected in 2014.

Figure 23: 2013 SO_2 monitoring sites in the Twin Cities Metropolitan Area



On June 2, 2010, the EPA finalized revisions to the primary SO_2 NAAQS. EPA established a new 1-hour standard which is met if the three-year average of the annual 99th percentile daily maximum 1-hour SO_2 concentration is less than 75 ppb. In addition to creating the new 1-hour standard, the EPA revoked the existing 24-hour and annual standards. Figure 24 describes the 2010 -2012 average 99th percentile 1-hour SO_2 concentration and compares them to the 1-hour standard. Minnesota averages ranged from 3 ppb at FHR 442 and FHR 443 to 17 ppb at FHR 420; therefore, all Minnesota sites currently meet the1-hour NAAQS for SO_2.

Figure 24: 1-hour SO_2 concentrations compared to the NAAQS*



* Blaine (6010) and Ely (7001) did not meet the minimum completeness criteria for design value calculations. A site meets the completeness requirement if 75% of required sampling days are valid for each calendar quarter included in the design value calculation. SO_2 at Ely (7001) was part of a one year assessment and not intended to collect 3 years of data for design value calculations.

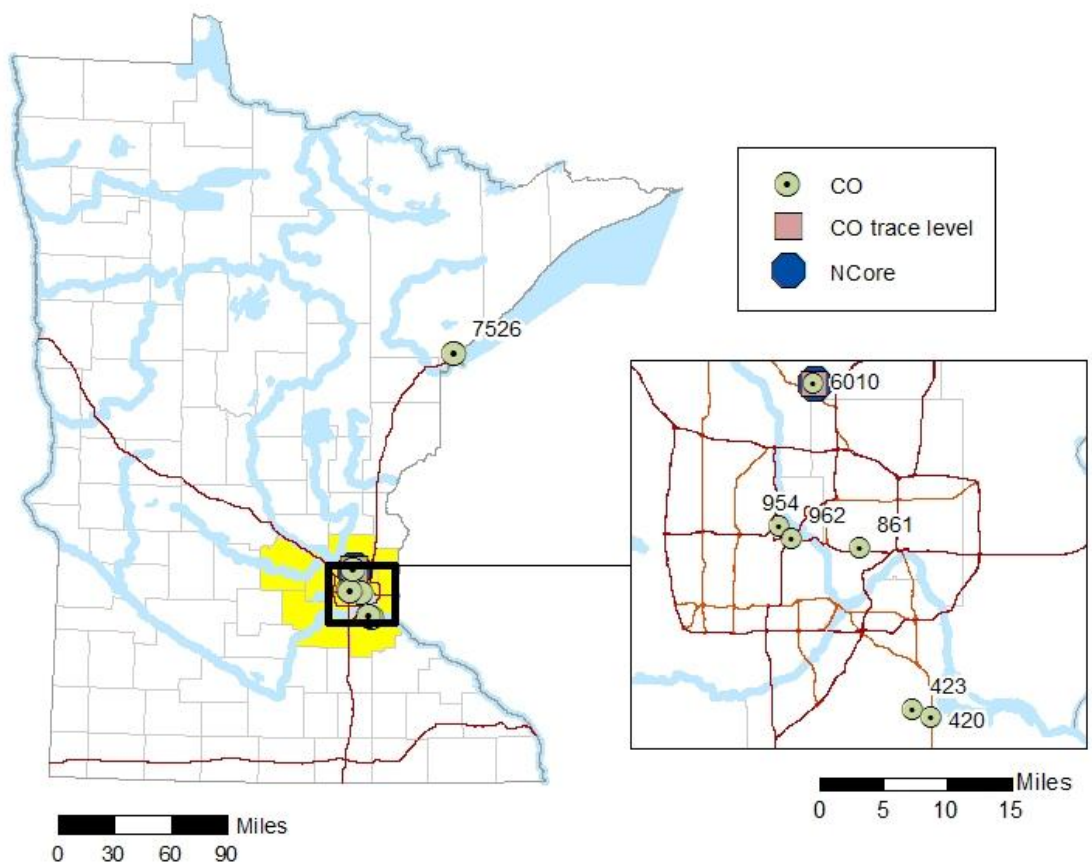
Carbon Monoxide (CO)

CO is a colorless and odorless toxic gas formed when carbon in fuels is not burned completely. CO enters the bloodstream and reduces the delivery of oxygen to the body's organs and tissues. Exposure to elevated CO concentrations is associated with vision problems, reduced ability to work or learn reduced manual dexterity, and difficulty performing complex tasks. Prolonged exposure to high levels can lead to death. Carbon monoxide is also oxidized to form carbon dioxide (CO_2) which contributes to climate change and the formation of ground-level ozone.

CO is monitored on a continuous basis and reported in hourly increments. Data are used to determine compliance with the NAAQS and reported as part of the AQI.

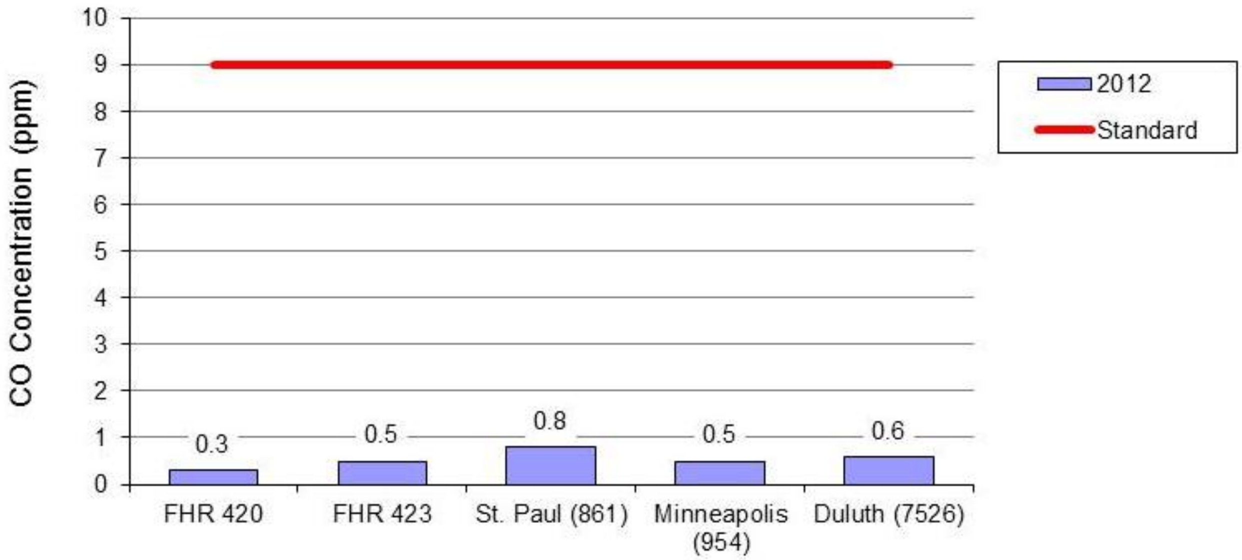
The MPCA monitors for CO at seven sites in Minnesota (figure 25). Trace level CO was added to the NCore site in Blaine (6010) in 2008. This trace level data will help us understand the role of CO at levels far below the NAAQS; however, due to performance issues with the monitoring equipment, trace level monitoring results have been unreliable. The MPCA is replacing the trace level monitoring instruments in the summer of 2013**.** The CO site in Duluth (7526) will close in 2014.

Figure 25: 2013 CO monitoring sites in Minnesota



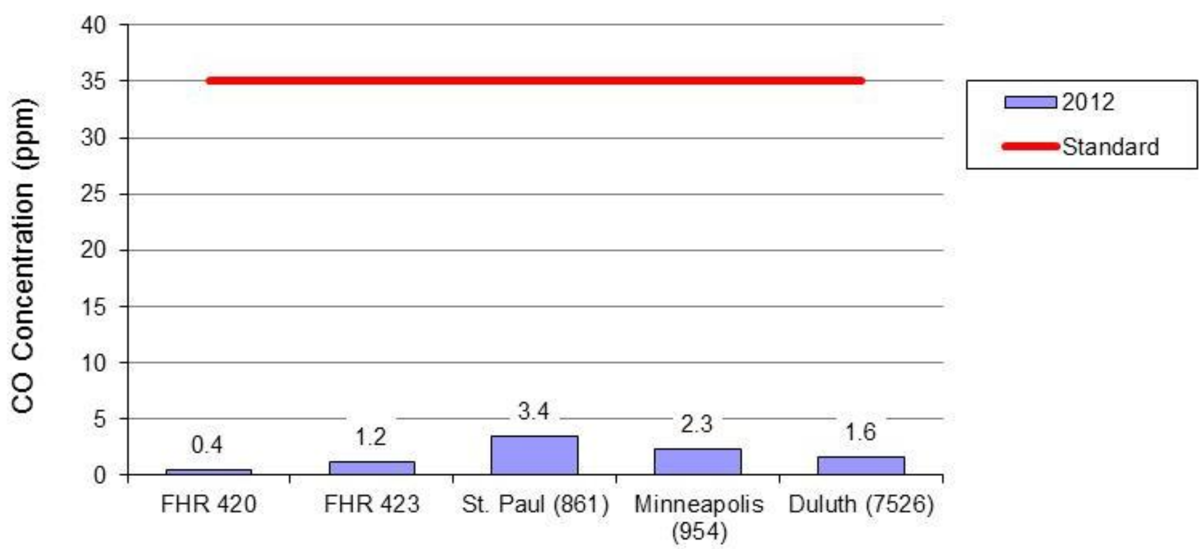
Minnesota currently meets applicable NAAQS for CO. A monitoring site meets the 8-hour CO NAAQS when the level of 9 ppm is not exceeded more than once per year. Figure 26 shows the second highest 8-hour average at Minnesota sites in 2012 and compares them to the standard. Minnesota values range from 0.3 ppm at FHR 420 and FHR 423 to 0.8 ppm in St. Paul (861).

Figure 26: 8-hour average CO concentrations compared to the NAAQS*



The 1-hour CO NAAQS is met when the level of 35 ppm is not exceeded more than once per year. Figure 27 shows the second highest 1-hour average at Minnesota sites in 2012 and compares them to the standard. Minnesota values range from 0.4 ppm at FHR 420 to 3.4 ppm in St. Paul (861).

Figure 27: 1-hour average CO concentrations compared to the NAAQS*



* Blaine (6010) did not meet the minimum completeness criteria for design value calculations. A site meets the completeness requirement if 75% of required sampling days are valid for each calendar quarter included in the design value calculation.

Air toxics

The EPA defines air toxics as those pollutants that cause or may cause cancer or other serious health effects (such as reproductive or birth defects), or adverse environmental and ecological effects. Air toxics include, but are not limited to, the 188 Hazardous Air Pollutants (HAPs) specified in the 1990 Clean Air Act Amendments (see http://www.epa.gov/ttn/atw/orig189.html for a list of HAPs). There are no federal requirements for air toxics monitoring in Minnesota, but the MPCA monitors for a variety of compounds in order to understand the risk to Minnesota citizens and to track reductions in emissions and concentrations of potentially hazardous compounds.

Air toxics do not have standards. Instead, the MPCA uses guidelines called health benchmarks. These benchmarks come from a variety of sources including the Minnesota Department of Health's Health Risk Values (HRVs) found at http://www.health.state.mn.us/divs/eh/risk/guidance/air/table.html, the EPA's Integrated Risk Information System (IRIS) found at http://www.epa.gov/iris/, and California's Office of Health Hazard Assessment found at http://www.oehha.ca.gov/air.html.

The MPCA monitors three types of air toxics: 59 volatile organic compounds (VOCs), seven carbonyls, and 15 metals. For information on concentrations of and risks from air toxics in Minnesota, visit the MPCA website at http://www.pca.state.mn.us/air/airtoxics.html. Samples are collected once every six days over a 24-hour period; the resulting concentration is a 24-hour average. Between October 2012 and March 2013, air toxics samples were collected once every twelve days due to resource issues. Sampling returned to a one in six day schedule on April 1, 2013.

Volatile Organic Compounds (VOCs) and Carbonyls

The MPCA analyzes samples for 59 VOCs and 7 carbonyls. Table 10 lists the VOCs and table 11 lists the carbonyls monitored by the MPCA. Samples are analyzed using EPA Compendium Methods TO-15 for VOCs and TO-11A for carbonyls.

The MPCA monitors VOCs and carbonyls at 17 sites in Minnesota. These sites are primarily located in the Twin Cities metropolitan area, with an additional site for VOCs and carbonyls in Duluth (7549). Figure 28 shows the locations of the sites.

In summer 2013 VOCs and carbonyls will be added to the Near-Road site in Minneapolis. In response to new legislation the MPCA will develop a process to identify locations in the Twin Cities to deploy an additional VOC and carbonyl monitor for short-term monitoring. Monitoring may begin in 2013 as sites are located and equipment and infrastructure are in place.

Metals

Metals are extracted from TSP filters and analyzed using ICP-AES following an EPA FEM method for lead determination (EQL-0311-196). Table 12 lists the metals analyzed by MPCA.

The MPCA monitors metals at 15 sites in Minnesota. These sites are primarily located in the Twin Cities metropolitan area, with additional sites in Virginia (1300) and St. Cloud (3053). Figure 28 shows the locations of the sites.

In summer 2013 metals will be added to the Near-Road site in Minneapolis (962) and will close in St. Cloud (3023) and Anoka (6020). In response to new legislation the MPCA will develop a process to identify locations in the Twin Cities to deploy an additional metals monitor for short-term monitoring. Monitoring may begin in 2013 as sites are located and equipment and infrastructure are in place.

Figure 28: 2013 Air Toxics monitoring sites in Minnesota

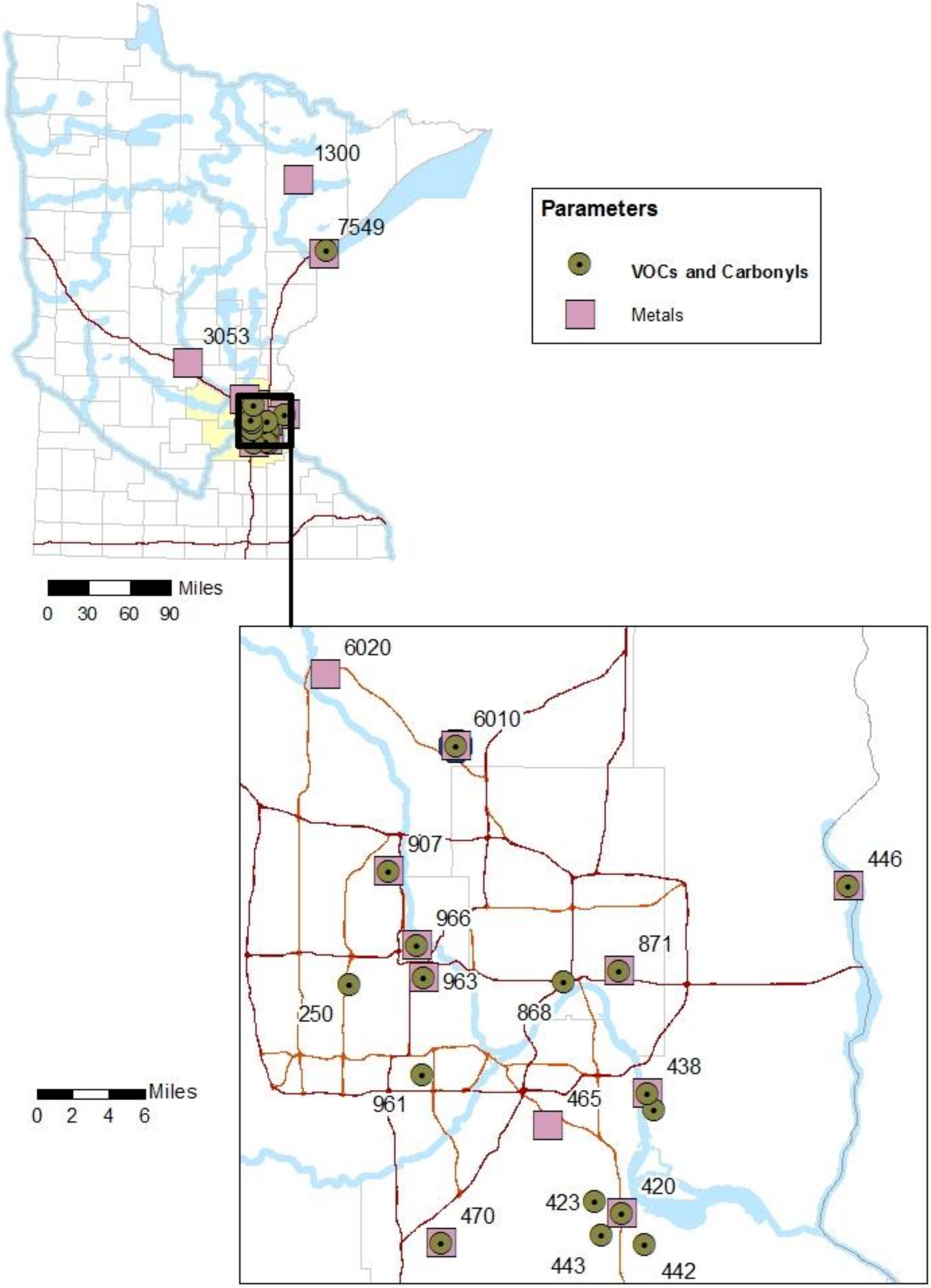


Table 10: VOCs monitored by MPCA in 2013

Parameter	CAS #	EPA Parameter Code
1,1,2,2-tetrachloroethane	79-34-5	43818
1,1,2,3,4,4-Hexachloro-1,3-butadiene	87-68-3	43844
1,1,2-Trichloroethane	79-00-5	43820
1,1-Dichloroethane	75-34-3	43813
1,1-diChloroEthene	75-35-4	43826
1,2,4-Trichlorobenzene	120-82-1	45810
1,2,4-Trimethylbenzene	95-63-6	45208
1,2-Dichloropropane	78-87-5	43829
1,3,5-Trimethylbenzene	108-67-8	45207
1,3-Butadiene	106-99-0	43218
2-Propanol	67-63-0	43312
4-Ethyltoluene	622-96-8	45228
Benzene	71-43-2	45201
Benzyl chloride	100-44-7	45809
Bromodichloromethane	75-27-4	43828
Carbon disulfide	75-15-0	42153
Carbon tetrachloride	56-23-5	43804
Chlorobenzene	108-90-7	45801
Chloroform	67-66-3	43803
cis-1,2-Dichloroethene	156-59-2	43839
cis-1,3-Dichloropropene	10061-01-5	43831
Cyclohexane	110-82-7	43248
Dibromochloromethane	124-48-1	43832
Dichlorobenzene (m)	541-73-1	45806
Dichlorobenzene (o)	95-50-1	45805
Dichlorobenzene (p)	106-46-7	45807
Dichlorodifluoromethane (Freon 12)	75-71-8	43823
Dichloromethane	75-09-2	43802
Dichlorotetrafluoroethane (Freon 114)	76-14-2	43208
Ethyl Alcohol	64-17-5	43302
Ethyl Chloride	75-00-3	43812
Ethylbenzene	100-41-4	45203
Ethylene chloride	107-06-2	43815
Ethylene dibromide	106-93-4	43843
Heptane	142-82-5	43232
Hexane	110-54-3	43231
Methyl bromide	74-83-9	43819
Methyl butyl ketone	591-78-6	43559
Methyl chloride	74-87-3	43801
Methyl chloroform	71-55-6	43814
Methyl ethyl ketone	78-93-3	43552
Methyl methacrylate	91-20-3	43441
Methyl tert-butyl ether	1634-04-4	43372
Naphthalene	80-62-6	17141
Propylene	115-07-1	43205
Styrene	100-42-5	45220
Tetrachloroethene	127-18-4	43817
Tetrahydrofuran	109-99-9	46401
Toluene	108-88-3	45202
trans-1,2-Dichloroethene	156-60-5	43838
trans-1,3-Dichloropropene	10061-02-6	43830
Tribromomethane	75-25-2	43806
Trichloroethene	79-01-6	43824
Trichlorofluoromethane (Freon 11)	75-69-4	43811
Trichlorotrifluoroethane	76-13-1	43207
Vinyl acetate	108-05-4	43447
Vinyl chloride	75-01-4	43860
Xylene (m&p)	108-38-3	45109
Xylene (o)	95-47-6	45204

Table 11: Carbonyls monitored by MPCA in 2013

Parameter	CAS #	EPA Parameter Code
Acetaldehyde	75-07-0	43503
Acetone	67-64-1	43551
Benzaldehyde	100-52-7	45501
Butryaldehyde	123-72-8	43510
Trans-Crotonaldehyde	123-73-9	43516
Formaldehyde	50-00-0	43502
Propionaldehyde	123-38-6	43504

Table 12: Metals monitored by MPCA in 2013

Parameter	CAS #	EPA Parameter Code
Aluminum	7429-90-5	12101
Antimony	7440-36-0	12102
Arsenic	7440-38-2	12103
Barium	7440-39-3	12107
Beryllium	7440-41-7	12105
Cadmium	7440-43-9	12110
Chromium	16065-83-1	12112
Cobalt	7440-48-4	12113
Copper	7440-50-8	12114
Iron	15438-31-0	12126
Lead	7439-92-1	14129
Manganese	7439-96-5	12132
Nickel	7440-02-0	12136
Selenium	7782-49-2	12154
Zinc	7440-66-6	12167

Atmospheric deposition

Atmospheric deposition is monitored through the NADP. The NADP has two active sub-networks in Minnesota: the National Trends Network (NTN) and the Mercury Deposition Network (MDN).

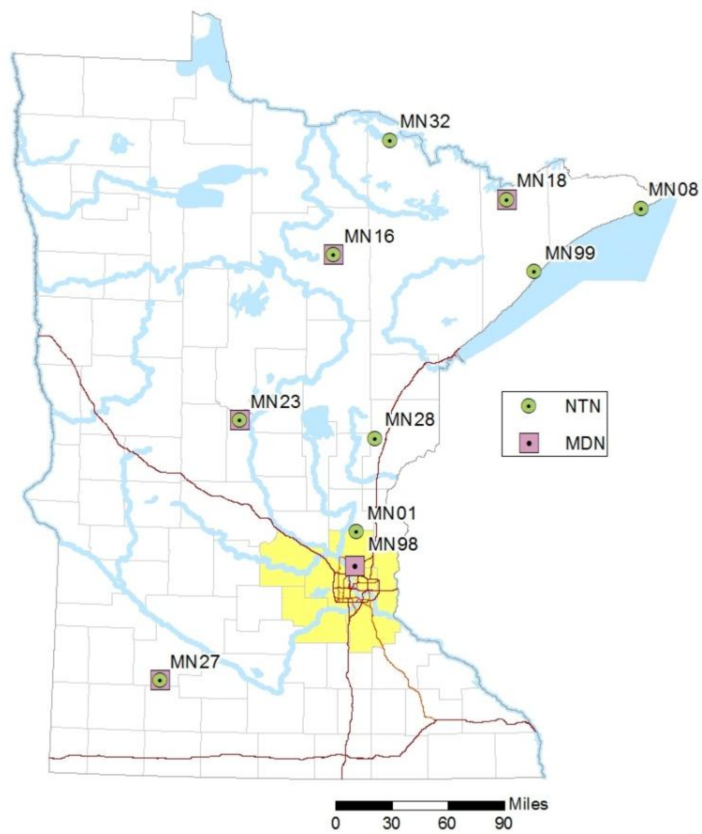
NTN collects weekly precipitation samples for pH, sulfate, nitrate, ammonium, chloride, and base cations (such as calcium and magnesium). NTN provides long-term, high-quality data for determining spatial and temporal trends in the chemical composition of precipitation. MDN collects weekly precipitation samples for analysis of total mercury and methylmercury concentrations. It supports a regional database of the weekly concentrations of mercury in precipitation and the seasonal and annual flux of total mercury in wet deposition.

Acid deposition

Acid deposition, or acid rain, is monitored as part of the NTN. Acid deposition begins with the burning of fossil fuels (such as coal, gas, or oil) for energy. The resulting air pollution contains SO_2 and NO_X. These gases react in the atmosphere to form various acidic compounds. These compounds may be deposited on the Earth by dry deposition, a process where acidic particles or gases settle on, or are absorbed by, plants, land, water, or building materials. The acidic compounds may also be deposited through rain, snow, and cloud water. These pathways are known as wet deposition.

The MPCA sponsors several sites that are part of the NADP (http://nadp.sws.uiuc.edu/) to monitor acid rain and mercury. The purpose of the network is to collect data on the chemistry of precipitation for monitoring of geographical and long-term trends. The precipitation at each station is collected weekly. It is then sent to a national contract laboratory where it is analyzed for hydrogen (acidity as pH), sulfate, nitrate, ammonium, chloride, and cations (such as calcium, magnesium, potassium, and sodium). Minnesota has nine monitoring sites for wet deposition. These sites are highlighted in figure 29. These sites are subject to changes in 2014 depending on funding.

Figure 29: 2013 Atmospheric deposition sites in Minnesota



Mercury (Hg) deposition

Mercury contamination of fish is a well documented problem in Minnesota. Because of wide-spread mercury contamination, the Minnesota Department of Health (MDH) advises people to restrict their consumption of large sport fish from all lakes and rivers. More than 95 percent of the mercury in Minnesota surface water comes from the atmosphere. In 2007, the EPA accepted Minnesota's mercury Total Maximum Daily Load (TMDL) plan that concludes that atmospheric mercury deposition must be reduced by 76 percent to achieve compliance with aquatic mercury standards.

Mercury is monitored in wet deposition in Minnesota as part of the NADP through the Mercury Deposition Network (MDN), which began in 1996 and now consists of over 85 sites. The MDN website can be found at http://nadp.sws.uiuc.edu/mdn/. The MDN collects weekly samples of precipitation, which are analyzed for total mercury. The objective of the MDN is to provide a nationally consistent survey of mercury in precipitation so that atmospheric loading to surface water can be quantified and long-term changes can be detected.

Minnesota was on the leading edge of mercury monitoring, establishing four sites as part of the MDN network in 1996, which are still operating. They include Marcell (MN16), Fernberg Road (MN18), Camp Ripley (MN23), and Lamberton (MN27). A site at Mille Lacs (MN22) operated from April 2002 to April 2007. A new urban site opened in Blaine (MN98) in February 2008. Figure 29 shows the locations of these sites. These sites are subject to changes in 2013 depending on funding.

In addition to quantifying total mercury, the MPCA also cooperates with the MDN network to measure methylmercury in four-week composites of the precipitation samples. Only a minority of the sites participate in the methylmercury analysis.

The MPCA also cooperates with the states of Michigan and Wisconsin to share the use of a trailer equipped with atmospheric mercury monitoring equipment. The equipment includes two Tekran 2537 mercury vapor analyzers, a generator, and a meteorological tower that can record wind speed and direction. The trailer is used to identify local sources of mercury vapor.

Hydrogen Sulfide (H_2S)

H_2S is a flammable, colorless gas that smells like rotten eggs even at low levels. It occurs naturally in sources such as crude petroleum and natural gas. It also results from bacterial breakdown of organic matter and is produced by human and animal wastes. Industrial activities such as food processing, coke ovens, kraft paper mills, petroleum refineries, and confined animal feed lots also emit H_2S.

Exposure to low concentrations of H_2S may cause irritation to the eyes, nose, and throat. It may also cause difficulty in breathing for some asthmatics.

Minnesota's state standard for H_2S is a 30-minute average of 30 ppb not to be exceeded more than twice in five days, or a 30-minute average of 50 ppb not to be exceeded more than twice per year. H_2S is primarily a concern in the summer, when biological activity is at a peak. Each summer, MPCA monitors several confined animal feedlots based on complaints due to odor and health effects from H_2S created from animal waste. H_2S can also be a concern from beet sugar facilities, as wastewater lagoons may release H_2S. Therefore, in addition to confined animal feedlot monitoring, the MPCA oversees industrial monitoring at the Southern Minnesota Beet Sugar Cooperative processing plant in Renville, and the American Crystal Sugar processing plants in Moorhead, Crookston, and East Grand Forks.

Total Reduced Sulfur (TRS)

TRS consists of the total sulfur from various compounds, including hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide. Sulfur dioxide is not included. Since the majority of TRS is H_2S and the other components are considered to be less toxic than H_2S, TRS can be used as a conservative measure and compared to the H_2S standard. No standard for TRS is available. The MPCA measures TRS at sites 420 and 423 near the Flint Hills Refinery in Rosemount and at site 436 near the Northern Tier Energy Refinery in St. Paul Park. Boise Cascade paper mill in International Falls also monitors TRS near its facility as a requirement of their operating permit. No changes are planned for 2014.

Meteorological data

Air pollution concentrations are strongly influenced by atmospheric conditions. Meteorological data can be an important tool for understanding and interpreting concentration data. The MPCA collects hourly wind speed, and wind direction data at sites 420 and 423 in Rosemount near the Flint Hills Resources refinery, at the NCore site in Blaine (6010), and at most H_2S monitoring sites. In Blaine, temperature, relative humidity, and barometric pressure are also measured. In 2013, meteorological parameters will be added to the new near-road NO_X site in Minneapolis.

Special studies

Fibers

As a requirement of its air permit Northshore Mining Company in Silver Bay monitors for fibers, which are defined as chrysotile and amphibole mineral particles with 3-to-1 or greater aspect ratio. The permit requires that the ambient air in Silver Bay contain no more fibers than that level ordinarily found in the ambient air of a control city. The MPCA chose the city of St. Paul as a control city and is presently monitoring mineral fibers in air at the Ramsey Health Center (868). The fiber levels in Silver Bay are being monitored by the Northshore Mining Company; the fiber levels in St. Paul are being monitored by the MPCA. The MDH is responsible for the analysis of all fiber samples collected by both parties.

Figure 30 shows the locations of the fiber monitors in Minnesota. No changes are planned for 2014.

Figure 30: 2013 Fiber monitoring sites in Minnesota

Black Carbon

Black carbon (or soot) is a component of fine particulate. It is correlated with elemental carbon which is monitored as part of the $PM_{2.5}$ speciation networks. Elemental carbon particles are emitted into the air from virtually all combustion activity, but are especially prevalent in diesel exhaust and smoke from the burning of wood, other biomass, and wastes. Black carbon is sometimes used as a surrogate for diesel smoke. Black carbon can be continuously monitored using an aethalometer, while elemental carbon is only available in Minnesota as a 24-hour average every three days. There are currently no black carbon monitors operating in Minnesota. The MPCA will begin monitoring black carbon at the Near-Road site in Minneapolis (962) in 2014.

Frac sand mining

In 2010 the MPCA began receiving public inquiries about projects to mine silica sand for use in hydraulic fracturing, or "fracking," a drilling method used for natural gas and oil wells. Southeastern and south central Minnesota and southwestern Wisconsin have extensive deposits of sand that meets the specifications required for fracking. Mining of certain types of these deposits has been occurring in the region for many years; however, there are new issues based on the quantity, type and depth of mining.

There are no federal or state standards for silica in ambient air; however, the MPCA uses a risk guideline value for respirable crystalline silica of the particle size smaller than 4 microns to assess the potential for human health effects. No generally accepted ambient monitoring method exists for this size. There are state standards for TSP and state and federal air quality standards for PM_{10} and for $PM_{2.5}$.

The MPCA has received some limited air measurements for particles around frac sand operations, and will continue to receive more. Ambient air monitors were placed at two sites at the Great Plains Sand facility (Jordan, MN) in 2012, and have been collecting total suspended particles (TSP), particulate matter less than 10µm (PM_{10}), and respirable crystalline silica (measured as PM_{10}) data since third quarter of 2012. These data are not yet sufficient for a comparison to ambient air quality standards and are considered preliminary at the current time (as of April 2013). Approximately three years of data are required for comparison to the PM_{10} standard, and a complete year of measurements is required for comparison to the respirable crystalline silica health benchmark.

Preliminary data from this monitoring and more information about frac sand mining are available on the MPCA's website (http://www.pca.state.mn.us/6f6dhkf).

The MPCA air monitoring program will continue to provide technical support to local units of government, permitted facilities, and to a Technical Advisory Team being formed by the Environmental Quality Board.

Hexavalent chromium

Hexavalent chromium is a chemical compound that contains the element chromium in the +6 oxidation state. It is used in the production of stainless steel, textile dyes, wood preservation, leather tanning, and as an anti-corrosion coating. At elevated concentrations in the air, chronic exposure to hexavalent chromium can cause cancer.

The MPCA measures total chromium as part of its standard metals monitoring program. Due to elevated levels of total chromium at the source-oriented lead monitoring site in St. Cloud, the MPCA, in conjunction with U.S. EPA Region 5 have deployed a hexavalent chromium monitor to assess the hexavalent chromium contribution to the total chromium results. Early monitoring results at this site indicated elevated levels of hexavalent chromium. As a result, MPCA and EPA Region 5 staff worked with a facility in the vicinity of the monitor to identify opportunities to reduce chromium emissions. Following the installation of pollution control equipment, hexavalent chromium concentrations at the site fell to a level below health concerns. This special assessment has been funded for one year of monitoring and is expected to conclude in June 2013.

Visibility

Air pollution that reduces visibility is called haze. Haze is caused when sunlight encounters fine particles in the air which absorb and scatter light. This haze can affect visibility in some of the most pristine and remote parts of Minnesota. In 1999, EPA issued new rules to implement the national goal in the Clean Air Act to prevent any future and remedy any ongoing impairment of visibility in Class I areas. The requirements of the Regional Haze rules are directed at achieving natural visibility conditions in the Class I areas by 2064. Minnesota has two Class I areas – the BWCAW and Voyageurs National Park.

Visibility is measured through the IMPROVE Aerosol Network (http://vista.cira.colostate.edu/IMPROVE/). As discussed in the $PM_{2.5}$ section of this report, the IMPROVE network measures $PM_{2.5}$ speciation as well as employing transmissometers and nephelometers to measure light extinction and light scattering. Minnesota has an IMPROVE site in each of the two Class I areas (BWCAW and Voyageurs). There are also additional sites in two southern Minnesota state parks, Blue Mounds and Great River Bluffs, to help better understand the regional transport of pollutants that impair visibility.

In addition, cameras are used to capture images that show haze. One camera is located in Grand Portage and points toward Isle Royale National Park in Lake Superior. The MPCA operates another camera in St. Paul which captures the downtown St. Paul skyline. On good visibility days, the downtown Minneapolis skyline is also visible. Pictures from Grand Portage and St. Paul can be viewed at http://www.mwhazecam.net. The US Forest Service also has a haze camera at Ely (7001); these images can be viewed at http://www.fsvisimages.com/fstemplate.aspx?site=BOWA1. All haze camera images are updated every 15 minutes.

No changes are expected with respect to visibility monitoring in 2014.

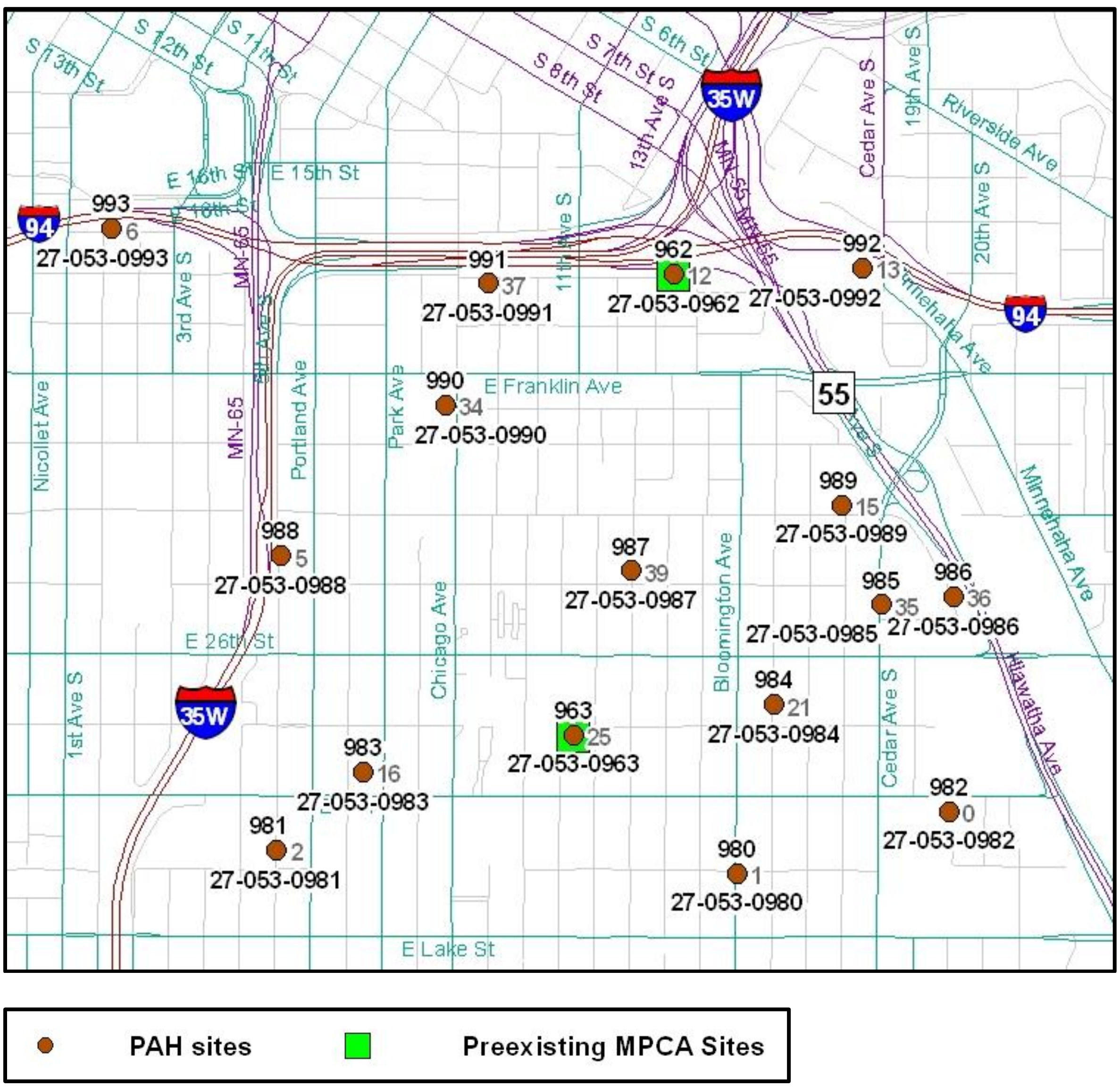
Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons (PAHs) can occur naturally in the environment but they are also created when things are burned (examples include motor vehicles burning fuel, home heating, diesel trucks, tobacco smoke, etc.). PAHs are a priority to environmental health agencies because they stay in the environment for long periods of time and high levels of exposure to PAHs are associated with health effects such as cancer and respiratory irritation.

The MPCA has received a U.S. EPA Community Scale Air Toxics Grant to study PAH levels in the air in South Minneapolis and Mille Lacs. The MPCA, the Minnesota Department of Health (MDH) and the Mille Lacs Band of Ojibwe Department of Natural Resources and Environment (DNRE) will monitor PAHs using passive and active techniques during a two year monitoring study.

Approximately 30 PAH compounds will be chemically analyzed, which is an extension of the EPA list of 16 priority PAHs. The monitoring will include four fixed-site active samplers; including two collocated at the Near-Road site (962), one at the HC Anderson School (963), and one at the Mille Lacs site (3051). The 20 passive samplers include two collocated at the Near-Road site (962), one at the HC Anderson School (963), two at Mille Lacs (3051), and the remaining located around South Minneapolis centered in the Phillips neighborhood. Figure 31 is a map of the monitoring sites in Minneapolis with MPCA and AQS site identification numbers. The monitoring will start in June 2013. Monitored concentrations of PAHs will be compared to health values to estimate risks. These risk results will also be compared to model results from Minnesota State Risk Screening tool (MNRiskS).

Figure 31: PAH monitoring sites in Minneapolis



2013 Network Changes

Changes to the MPCA Air Monitoring Network are intended to improve the effectiveness of monitoring efforts and to ensure compliance with the EPA National Ambient Air Monitoring Strategy. Table 13 lists the sites that were affected by changes in 2013 and details those changes. Following the table, the changes are summarized according to parameter network.

Table 13: 2013 Network Changes

MPCA Site ID	City Name	Site Name	Site Status	$PM_{2.5}$ FRM	$PM_{2.5}$ Continuous FEM	Ultra-fine Particle Counter	TSP and Metals	Ozone	Oxides of Nitrogen	Sulfur Dioxide	Carbon Monoxide	VOCs	Carbonyls	Meteorological Data	Hexavalent Chromium	Black Carbon	PAHs
TBD	Twin Cities metro area	TBD	A		A		A					A	A				
962	Minneapolis	Near-Road NO_X	A		A	A	A	A	A		A	A	A	A		A	A
963	Minneapolis	HC Andersen School															A
1300	Virginia	Virginia		T	A												
3051	Mille Lacs	Mille Lacs					T					T	T				A
3053	St. Cloud	Grede Foundries	T				T								T		
5008	Rochester	Rochester		A													
6020	Anoka	Federal Cartridge	T				T										
7001	Ely	Fernberg Road							T	T							

A = added
T = terminated

Fine Particulate Matter ($PM_{2.5}$)

- In 2013, the FRM monitor in Virginia (1300) was replaced by an FEM monitor; the FRM monitor moved to Rochester (5008).
- In summer 2013, an FEM monitor will be added to the Near-Road site (962) in Minneapolis.
- In response to new legislation the MPCA will develop a process to identify locations in the Twin Cities to deploy an additional $PM_{2.5}$ FEM monitor for short-term monitoring. Monitoring may begin in 2013 as sites are located and equipment and infrastructure are in place.

Total suspended particulate matter (TSP) and Metals

- In 2013, the TSP site in Mille Lacs (3051) closed upon completion of a one year air toxics assessment.
- Pending EPA approval, the MPCA intends to shut down two other TSP sites in Anoka (6020) and St. Cloud (3053) in July 2013. These two sites are source-oriented lead monitoring sites and monitoring data suggests that ambient lead concentrations are well below 50 percent of the lead NAAQS.
- In summer 2013, a TSP monitor will be added to the Near-road site (962) in Minneapolis.
- In response to new legislation the MPCA will develop a process to identify locations in the Twin Cities to deploy an additional TSP and metals monitor for short-term monitoring. Monitoring may begin in 2013 as sites are located and equipment and infrastructure are in place.

Ozone (O_3)

- In 2013, ozone was added to the Near-Road (962) site in Minneapolis.

Oxides of Nitrogen (NO_X)

- The NO_X monitor at Ely (7001) was removed in 2013 upon completion of a one year assessment. The data from this site will be used for a variety of modeling validation projects.
- The MPCA deployed one near-road NO_X monitoring site (962) in 2013 as part of the first phase of near-road monitor deployment at a new site along I-94 and I-35W in Minneapolis. See the Near-Road Air Monitoring in Minnesota Plan for a detailed description on how the location of the near-road monitoring site was chosen.
- Trace level NO/NO_y has been at the NCore site in Blaine (6010) since 2009; however, due to performance issues with the monitoring equipment, trace level monitoring results have been unreliable. The MPCA is replacing the trace level monitoring instruments in the summer of 2013.

Sulfur Dioxide (SO_2)

- The SO_2 monitor at Ely (7001) was removed in 2013 upon completion of a one year assessment. The data from this site will be used for a variety of modeling validation projects.
- An SO_2 monitor was added to the new near-road site (962) in Minneapolis in 2013.
- Trace level SO_2 has been at the NCore site in Blaine (6010) since 2009; however, due to performance issues with the monitoring equipment, trace level monitoring results have been unreliable. The MPCA is replacing the trace level monitoring instruments in the summer of 2013.

Carbon Monoxide

- In 2013, CO was added to the new near-road site (962) in Minneapolis.
- Trace level CO was added to the NCore site in Blaine (6010) in 2008; however, due to performance issues with the monitoring equipment, trace level monitoring results have been unreliable. The MPCA is replacing the trace level monitoring instruments in the summer of 2013**.**

Air Toxics – VOCs and Carbonyls

- Between October 2012 and March 2013, air toxics sampling frequency was reduced to once every twelve days due to resource issues. Sampling returned to a one in six day schedule on April 1, 2013.
- In 2013, the air toxics site at Mille Lacs (3051) closed upon completion of a one year air toxics assessment.
- In summer 2013, VOCs and carbonyls will be added to the Near-Road site in Minneapolis.
- In response to new legislation the MPCA will develop a process to identify locations in the Twin Cities to deploy an additional air toxics monitor for short-term monitoring. Monitoring may begin in 2013 as sites are located and equipment and infrastructure are in place.

Meteorological data

- In 2013, meteorological parameters were added to the new near-road site (962) in Minneapolis.

Hexavalent Chromium

- The special assessment in St. Cloud (3053) is expected to conclude in June 2013 after one year of monitoring.

Black Carbon

- The MPCA will begin monitoring black carbon at the Near-Road site (962) in Minneapolis in summer 2013.

Polycyclic Aromatic Hydrocarbons (PAHs)

- Monitoring will start in June 2013. See page 43 for more details on PAH monitoring.

2014 Proposed Changes

The changes that are proposed for 2014 are summarized in Table 14. Following the table, the proposed changes are summarized according to parameter network.

Table 14: 2014 Proposed Changes

MPCA Site ID	**City Name**	**Site Name**	**Site Status**	**$PM_{2.5}$ Continuous FEM**	**TSP and Metals**	**Carbon Monoxide**	**VOCs**	**Carbonyls**
909	Minneapolis	Pacific Street	T	T				
TBD	Minneapolis	TBD	A	A				
TBD	Twin Cities metro area	TBD	A	A	A		A	A
7526	Duluth	Torrey Building	T			T		

A = proposed to add
T = proposed to terminate

Fine Particulate Matter ($PM_{2.5}$)

- The $PM_{2.5}$ FEM monitor in Minneapolis at Pacific Street (909) may move to a new site in the North Minneapolis area.
- In response to new legislation the MPCA will develop a process to identify locations in the Twin Cities to deploy an additional $PM_{2.5}$ FEM monitor for short-term monitoring in 2014 and 2015.

Total suspended particulate matter (TSP) and Metals

- In response to new legislation the MPCA will develop a process to identify locations in the Twin Cities to deploy an additional TSP and metals monitor for short-term monitoring in 2014 and 2015.

Carbon Monoxide

- The CO site in Duluth (7526) will close in 2014.

Air Toxics – VOCs and Carbonyls

- In response to new legislation the MPCA will develop a process to identify locations in the Twin Cities to deploy an additional air toxics monitor for short-term monitoring in 2014 and 2015.

Summary of the Public Comment Period

This report was available for public comment from June 7, 2013 through July 8, 2013. Two comment letters or emails were received. The following is a summary of the issues addressed in those comments and the response from the Air Monitoring Unit at the MPCA:

COMMENT: The stated objective of NO_X and SO_2 monitoring in Ely is to establish rural background levels in Minnesota; however, the monitors were not operated for a sufficient period of time (three years) for background concentrations to be developed. Cliffs Natural Resources Incorporated recommended and requested that monitoring be continued in Ely or another applicable site until adequate data is collected to characterize the background levels of these parameters in northeastern Minnesota.

RESPONSE: The objective of these monitors was mischaracterized by the Air Monitoring Unit. These monitors were actually intended to be used for a variety of model validation projects which require one year of monitoring data. Unfortunately the MPCA does not have the internal or collaborative resources needed to operate these monitors for three years near Ely. If such resources become available in the future, the MPCA would consider returning to this site to monitor for the entire three year period needed to establish rural background concentrations.

COMMENT: Cliffs Natural Resources Incorporated commented that the plan mistakenly referred to the fiber monitoring in Silver Bay as asbestos monitoring when the fibers being monitored are not actually asbestos. They objected to the language used in the plan that implied that the monitoring was required by a court order and asserted that there is no legal or scientific basis to justify the monitoring.

RESPONSE: This comment was forwarded to the Metallic Mining Sector for review. The word asbestos was removed from the plan and replaced with fibers, and the other changes were made to more accurately describe the monitoring. The MPCA will continue to monitor fibers in the control city of St. Paul and reference the monitoring in the annual plan as long as it remains a requirement of North Shore Mining Company's air permit.

The MPCA will proceed with the changes proposed in the plan pending EPA approval. The public is welcome to comment on our air monitoring activities at any time throughout the year.