Air Quality in Minnesota: 2015

Data to support the Minnesota Smoke Management Plan

The Minnesota Smoke Management Plan (SMP) is designed to mitigate the nuisance and public safety hazards posed by prescribed fire and managed wildfire activities in the state of Minnesota. The SMP outlines guidance and best practices to limit smoke intrusions into populated areas, prevent deterioration of air quality and National Ambient Air Quality Standards (NAAQS) violations, and address visibility impacts in federal mandatory Class I areas.

This document summarizes air quality conditions across Minnesota for ozone, fine particles, and PM_{10} in 2015. In addition, this document summarizes days where air pollution levels exceed federal air quality standards. Each of these event days have been qualitatively evaluated to determine whether the exceedance was linked to prescribed or wild-fire events. In the future, to more accurately determine the impacts of fire activity on ambient air quality, the MPCA may perform a more detailed analysis on speciated particulate monitoring results.

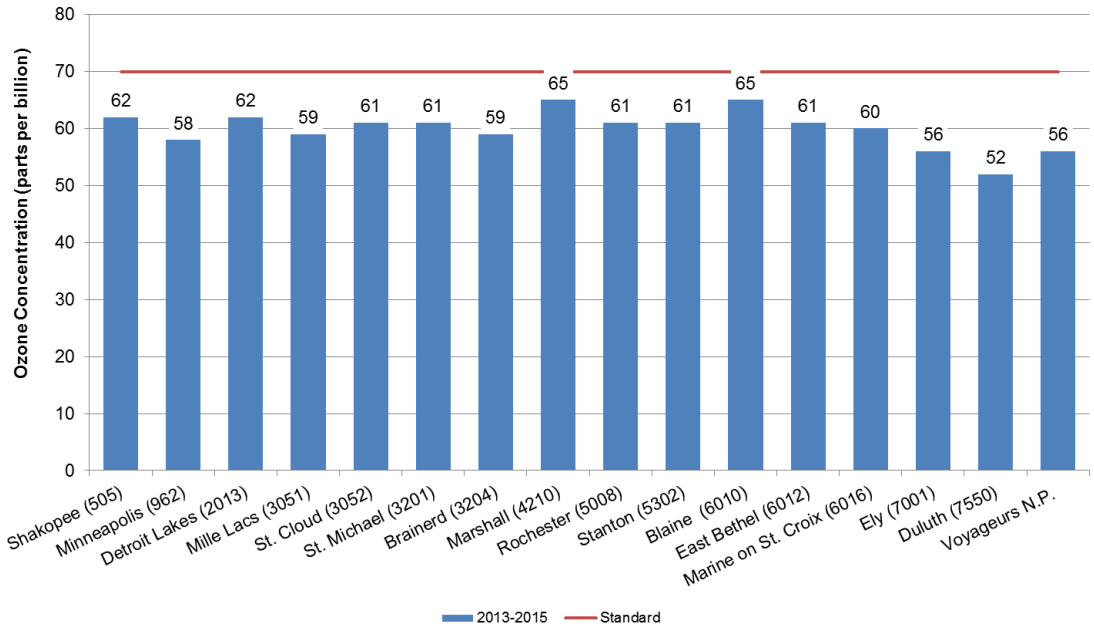
Ozone pollution in Minnesota

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.

8-hour ozone standard

A monitoring site meets the 8-hour ozone standard if the three-year average of the fourth highest daily maximum 8-hour ozone concentration is less than or equal to 70 ppb. All monitoring sites in Minnesota meet the 8-hour ozone standard.

Ozone concentrations compared to the federal standard, 2013-2015



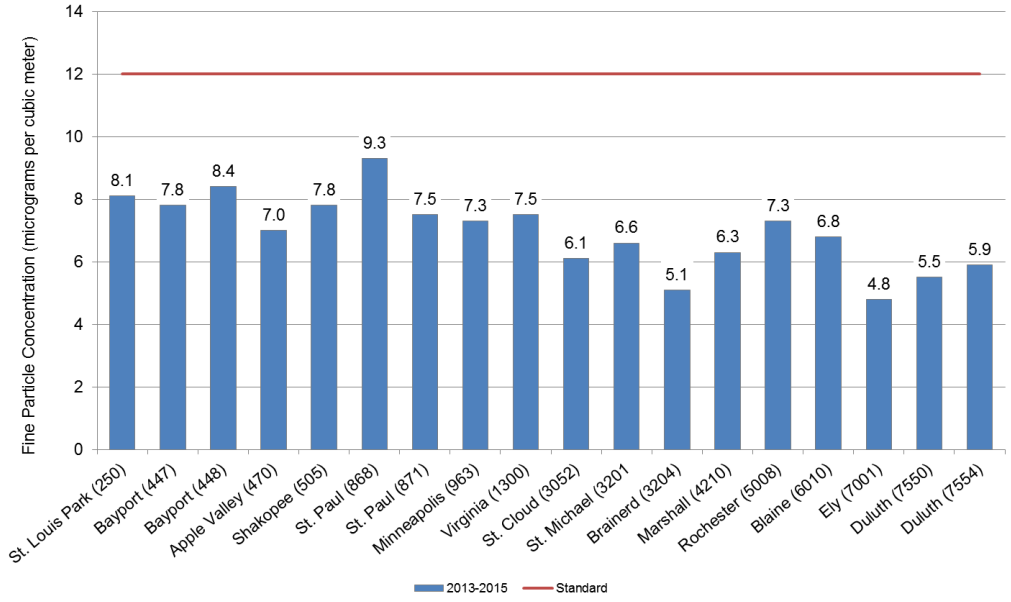
Fine particle ($PM_{2.5}$) pollution in Minnesota

Fine particles ($PM_{2.5}$) are a chemically and physically diverse mixture of different sizes of very small particles. Fine particles contain a complex mixture of chemicals including ammonia sulfate, ammonium nitrate, particle-bound water, elemental carbon, organic compounds, and inorganic material including soil and metals.

Annual fine particle standard

A monitoring site meets the annual fine particle standard if the three-year average of the annual average $PM_{2.5}$ concentration is less than or equal to 12 µg/m^3. All monitoring sites in Minnesota meet the annual fine particle standard.

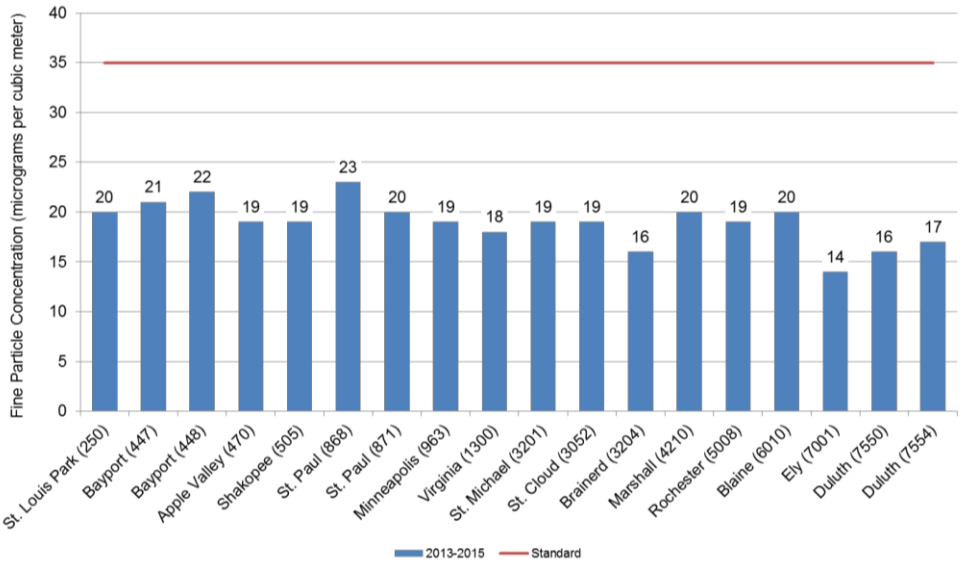
Annual average fine particle concentrations compared to the federal standard, 2013-2015



Daily fine particle standard

A monitoring site meets the daily fine particle standard if the three-year average of the annual 98th-percentile daily PM2.5 concentration is less than or equal to 35 µg/m^3. All monitoring sites in Minnesota meet the daily fine particle standard.

Daily (24-hour) fine particle concentrations compared to the federal standard, 2013-2015



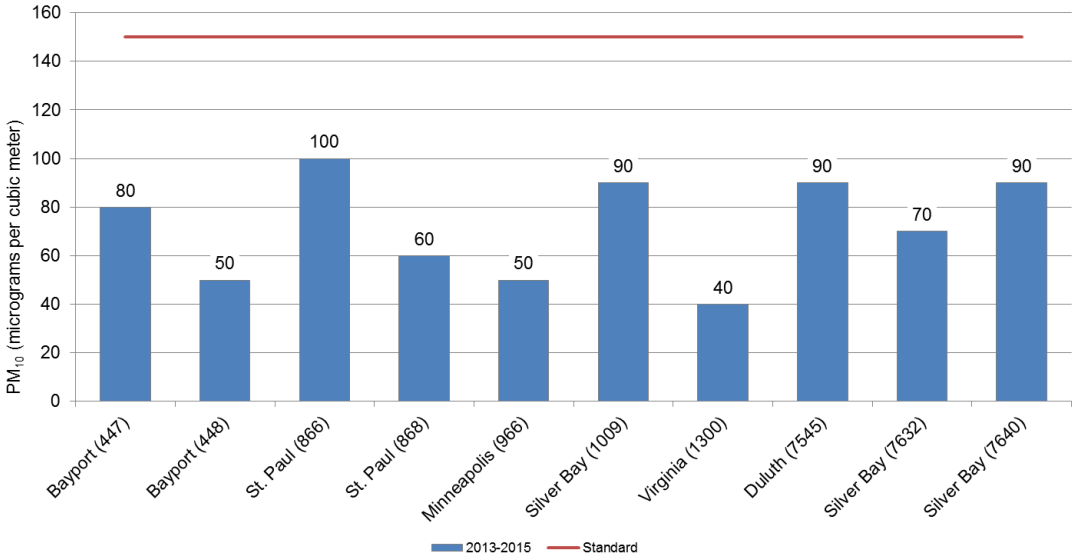
PM_{10} pollution in Minnesota

PM_{10} includes all particles with an aerodynamic diameter less than 10 microns.

Daily PM_{10} standard

A monitoring site meets the 24-hour PM_{10} standard when the average number of daily PM_{10} concentrations greater than 150 ug/m3 over three years is not greater than 1. To compare ambient PM_{10} concentrations to this standard, we compare the daily background PM_{10} concentration to the level of the standard. The daily PM_{10} background concentration is established following the calculation methodology described in EPA's "PM_{10} Sip Development Guidance" (EPA-450/2-86-001, June 1987, Table 6-1). Depending on the total number of samples collected over a three-year period, the daily PM10 background concentration is calculated as the 1st, 2nd, 3rd or 4th highest daily PM_{10} concentration measured over three-years. Currently, all PM_{10} monitoring sites in Minnesota meet the PM_{10} standard.

PM_{10} daily (24-hour average) background concentration compared to the level of the federal standard, 2013-2015

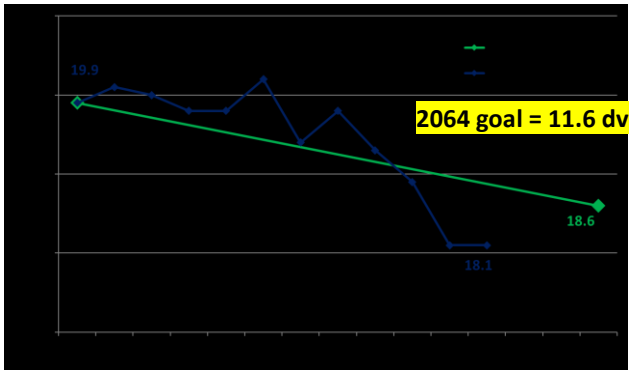


Progress towards meeting regional haze goals

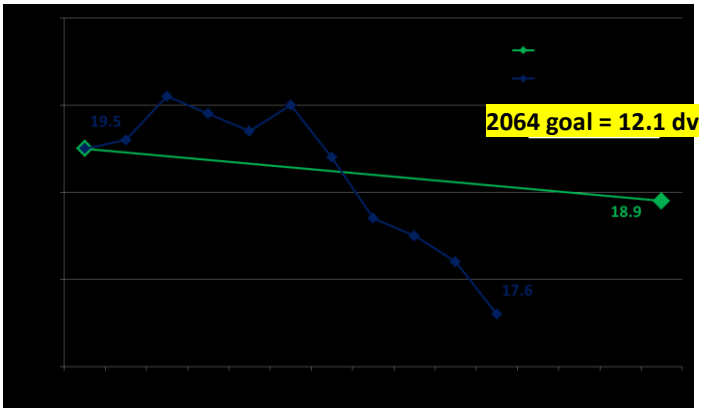
In 1999, EPA established a regulatory program to reduce haze caused by man-made air pollution at national parks and wilderness (Class I) areas. The goal of the regional haze rule is to achieve natural visibility conditions in Class I areas by 2064, with interim progress goals every 10 years. The first interim progress goal is established for 2018.

Both the Boundary Waters Canoe Area Wilderness and Voyageurs National Park are expected to meet the 2018 interim progress goal toward natural visibility conditions. Visibility improvements at the Boundary Waters were hampered in 2011 by the Pagami Creek wildfire, which burned 145 square miles of forest that year.

Boundary Waters Canoe Area Wilderness



Voyageurs National Park



Days with ambient monitoring results above the daily air quality standards

Days with daily maximum 8-hour ozone concentrations above 70 ppb

	Anoka	Carlton	Lyon	Washington	Meteorological Description – Evidence of Fire Activity?
5/2/2015	70	71			Moderate southerly winds ahead of an approaching cold front carried regional pollutants and moisture into the Twin Cities. Mostly sunny skies and temperatures in the low-80s enhanced ozone formation. Satellite data indicates that smoke from fires in Asia were present in Minnesota, but Lidar measurements show the smoke was present from 3-10 km AGL. Satellite derived fire detects also identified a number of fire points across southern and central Minnesota. The MNICS reported burn notification consolidated dataset has a record of a prescribed burn conducted by the U.S. Fish and Wildlife Service in Sherburne County. The prominent wind direction suggests this prescribed fire did not influence the ozone monitors on this date. The 24-hour back trajectories suggest this event was influenced by transport from the Twin Cities metro area.
5/27/2015			74		Mostly sunny skies and warm temperatures enhanced ozone formation. Satellite imagery detected elevated tropospheric NO2 and smoke extending from central/southern Canada into Minnesota. Ozone was above 70 ppb in Marshall, Brookings, S.D., and Sioux Falls, S.D. The MNICS reported burn notification consolidated dataset has no records of prescribed burning upwind of the monitor on this date.
6/9/2015	73			71	Northwesterly winds transported smoke from fires in Canada into the Twin Cities, increasing particle levels. In addition, calm winds reduced pollutant dispersion. Furthermore, mostly sunny skies and afternoon temperatures near 90F increased ozone formation. The MNICS reported burn notification consolidated dataset has no records of prescribed burning upwind of the monitor on this date.
8/28/2015			76		Winds were primarily southerly/southeasterly. Satellite imagery detected elevated smoke which was transported from fires in eastern Washington and northern Idaho across much of Montana, North Dakota, South Dakota, and western Minnesota, including Marshall. This smoke likely contributed to elevated ozone in Marshall. The MNICS reported burn notification consolidated dataset has no records of prescribed burning upwind of the monitor on this date.

Days with daily average $PM_{2.5}$ concentrations above 35.4 µg/m³

	Anoka	Becker	Beltrami	Crow Wing	Hennepin	Lake	Olmsted	Ramsey	Saint Louis	Stearns	Washington	Meteorological Description – Evidence of Fire Activity?
2/7/2015					38.2							A weak low-pressure system over the Dakotas generated light easterly winds in Minneapolis-St. Paul, limiting pollutant dispersion and a moist air mass supported particle production. Satellite data indicates that nitrate concentrations were elevated across the Great Lakes Region. The MNICS reported burn notification consolidated dataset has no records of prescribed burning upwind of the monitor on this date.
6/9/2015						39						Northwesterly winds transported smoke from fires in Canada into the Twin Cities, increasing particle levels. In addition, calm winds reduced pollutant dispersion. The MNICS reported burn notification consolidated dataset has no records of prescribed burning upwind of the monitor on this date.
7/3/2015		47.1	37.6	41.2								Smoke originating from fires in Canada was transported into Minnesota beginning in the afternoon, leading to elevated particle levels. The MNICS reported burn notification consolidated dataset has no records of prescribed burning upwind of the monitor on this date.
7/4/2015	37.1	43.6	47.7	50.3				49		60.3	44.2	Smoke originating from fires in Canada was transported into Minnesota leading to elevated particle levels. Furthermore, fireworks displays increased particle concentrations locally. The MNICS reported burn notification consolidated dataset has no records of prescribed burning upwind of the monitor on this date.
7/6/2015							41.6	38.1	36.7		38	Moderate northwesterly winds in the afternoon transported

	Anoka	Becker	Beltrami	Crow Wing	Hennepin	Lake	Olmsted	Ramsey	Saint Louis	Stearns	Washington	Meteorological Description – Evidence of Fire Activity?
												smoke from Canadian wildfires into the region. The MNICS reported burn notification consolidated dataset has no records of prescribed burning upwind of the monitor on this date.

Days with daily average PM_{10} concentrations above 150 µg/m³

Daily average PM_{10} concentrations were above 150 µg/m^3 on two days in 2015. Both of these high days, April 1, 2015 and September 15, 2015 occurred at an air monitor in North Minneapolis. The MPCA has identified a nearby facility as the likely source of these elevated PM_{10} concentrations. These PM_{10} events are not associated with prescribed fire activity.