

Boundary Waters (BOWA) 2016 Site Report

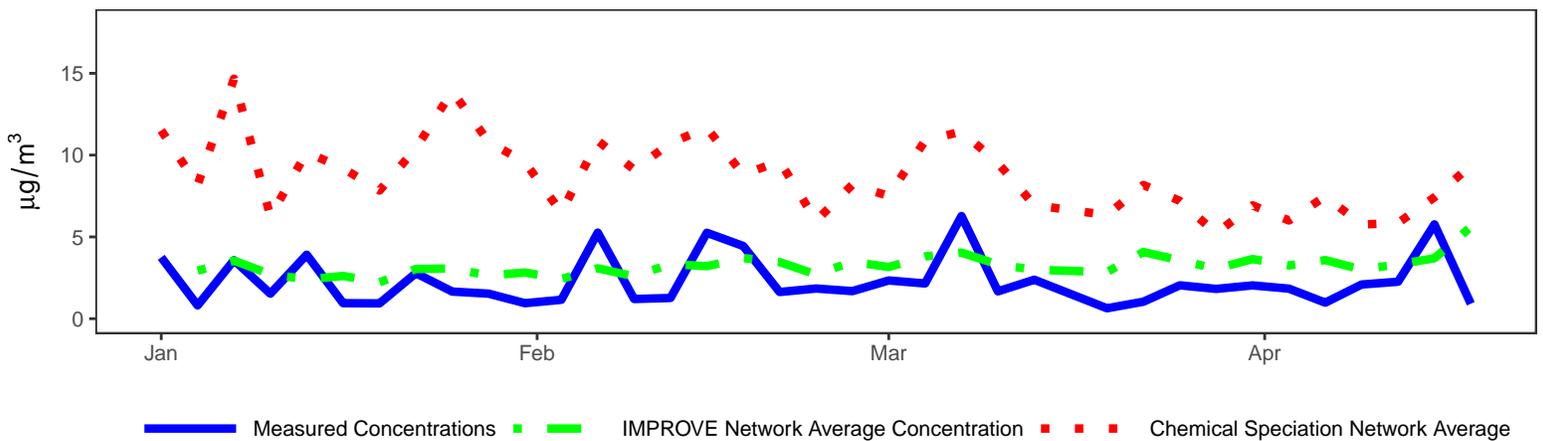
The Interagency Monitoring of Protected Visual Environments (IMPROVE) is a long-term air pollution measurement program designed to document and track visibility in protected areas. IMPROVE samples and analyzes the haze particles that impair visibility so their sources can be identified and addressed.

Percent of Samples from BOWA Successfully Collected and Analyzed Per Year

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
78	84	66	65	66	92	80	81	95	98	98	93	97	88	99	99	59

In the plots below, mass concentrations measured at Boundary Waters give a sense of the seasonal trends of air quality in the area as well as show significant air quality events such as wildfires and dust storms. These are plotted alongside the average measurements across the IMPROVE network as well as its related Chemical Speciation Network (CSN). The CSN sites are located in urban areas where the populations are highest. In general, lower concentrations would suggest better visibility.

Daily Fine Particle Mass Concentrations in 2016



Trend in Fine Particle Mass Concentration Since 2000

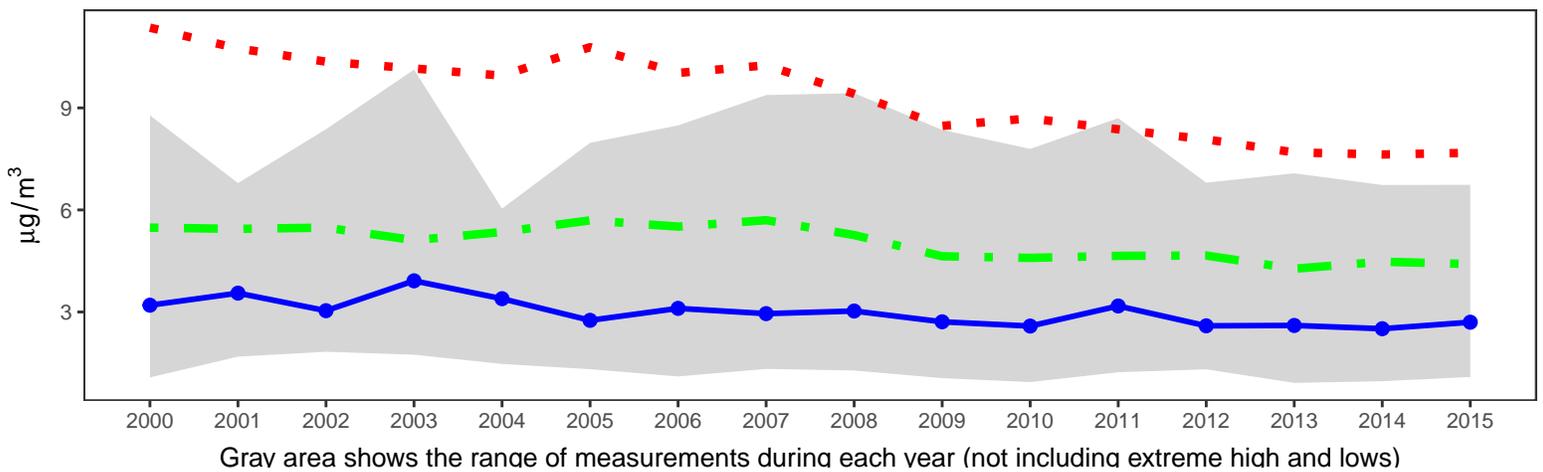
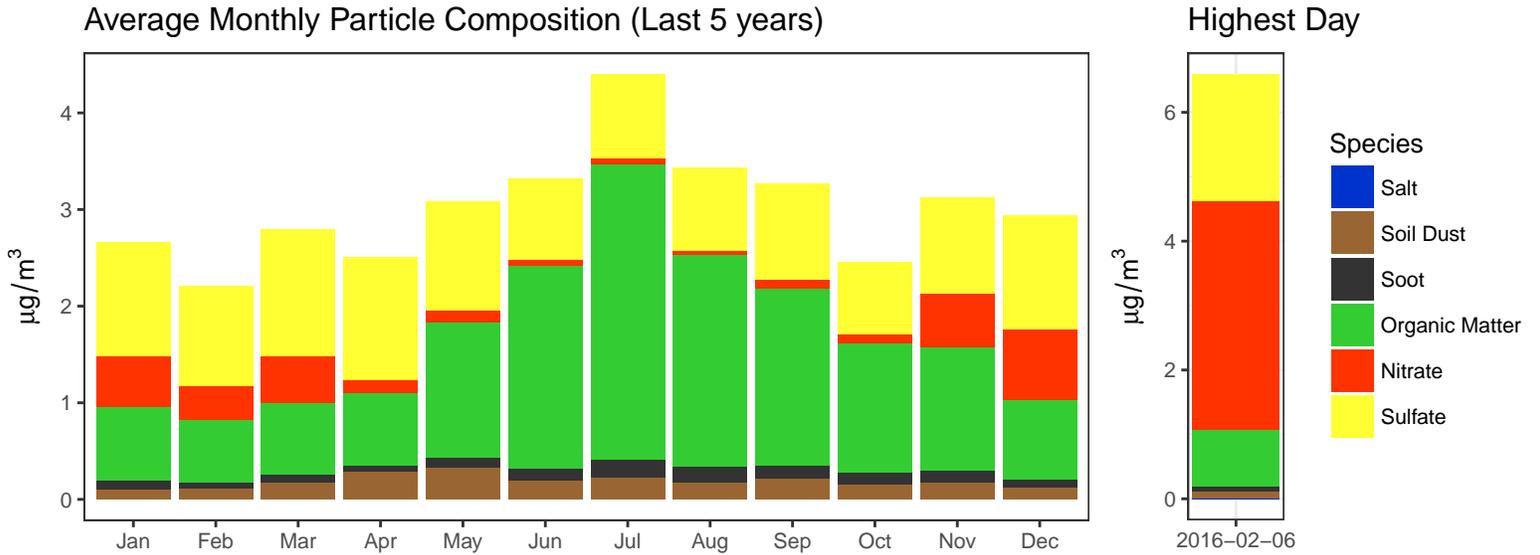


Figure 1: Annual median concentrations. Gray area shows 10th and 90th percentile.

More Information

- To view and download IMPROVE data, you can visit: www3.epa.gov/airquality/airdata/
- The Univ. of California, Davis website with information about current research and publications: airquality.crocker.ucdavis.edu
- The Colorado State Univ. website with data resources, literature, and visibility overviews: vista.cira.colostate.edu/improve/
- The EPA website with guidance documents and background information: www3.epa.gov/ttnamti1/visdata.html
- Real-time air monitoring data for the United States: www.airnow.gov

The following plots summarize the chemical composition of particles collected at this site on a monthly average (left) and for the day with the highest measured mass during 2016 (right).



Species	Natural Sources	Human-Made Sources
Salt	Ocean spray, dry lakebeds	Chemical manufacturing, lake consumption
Soil Dust	Soil resuspension, dust storms	Construction, agriculture, deforestation, unpaved roads
Soot	Wildfires	Motor vehicles, wood burning, smoking
Organic Matter	Plants, animals, wildfires	Motor vehicles, cooking oils, household cleaners
Nitrate	Plants, animals	Fertilizer, stock yards, chemical manufacturing
Sulfate	Volcanism	Coal-fired power plants, chemical manufacturing

The following map shows the average mass concentrations for both IMPROVE and the urban Chemical Speciation Network (CSN) sites in the region. The symbols indicate which network the sites are associated with. The color bar indicates the average annual mass concentration (micrograms per cubic meter) measured at each site in 2016.

