Carlsbad Caverns National Park (CAVE1) 2024 Site Report

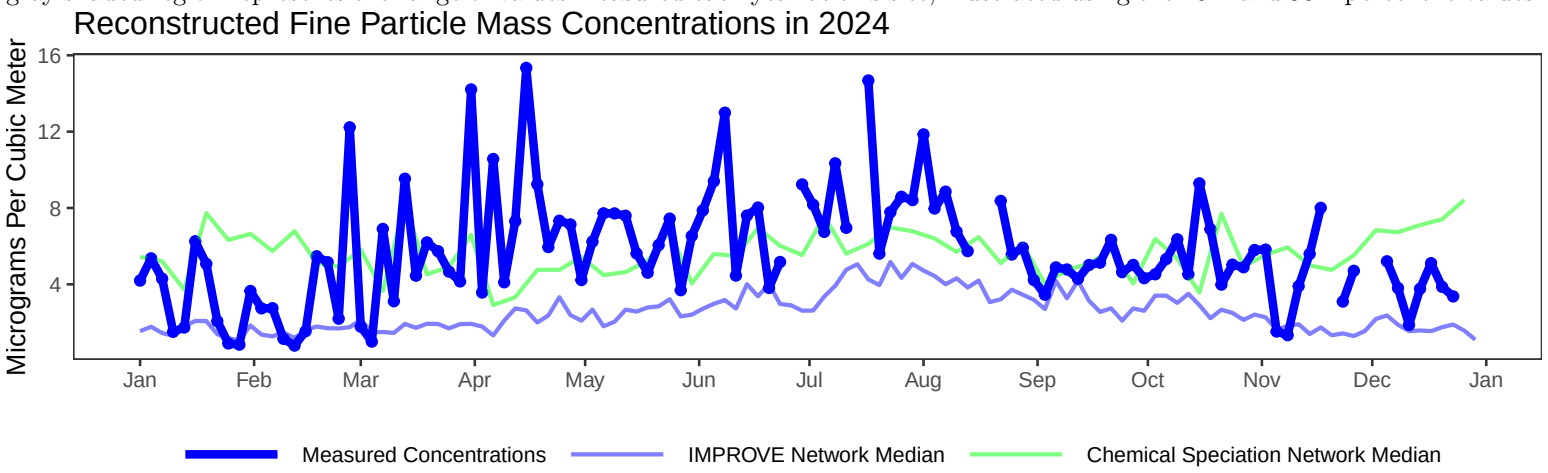
The Interagency Monitoring of Protected Visual Environments (IMPROVE) is a long-term air pollution measurement program designed to document and track visibility in protected areas. IMPROVE samples and analyzes the haze particles that impair visibility so their sources can be identified and addressed.

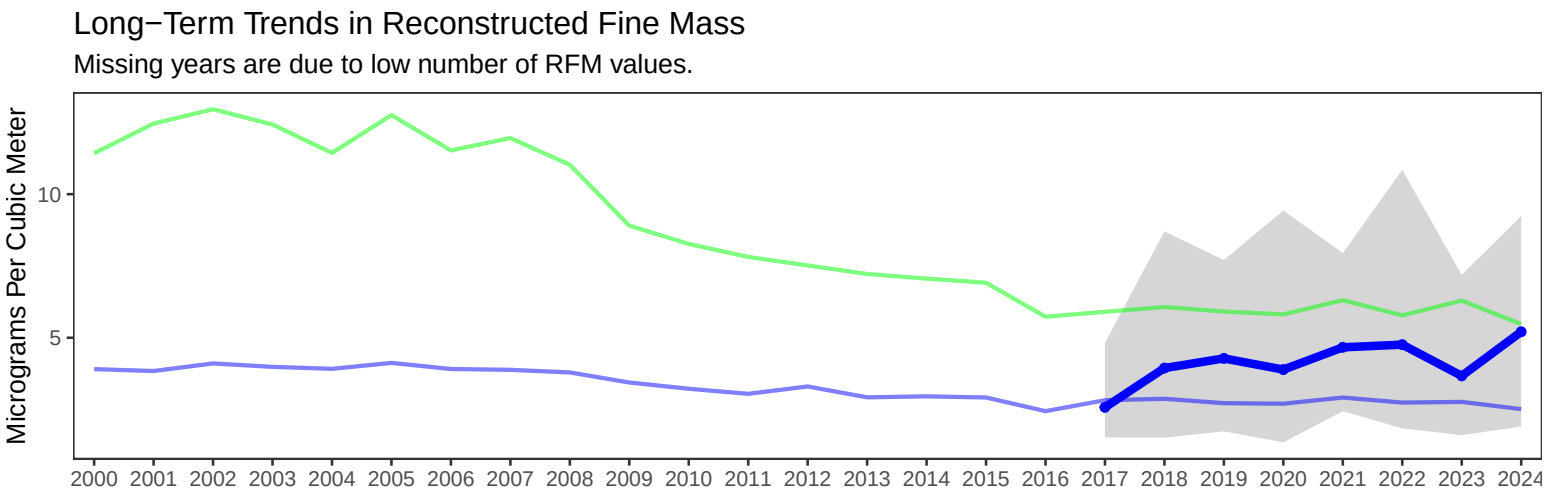
Percent of Samples Successfully Collected and Analyzed Per Year

2017	2018	2019	2020	2021	2022	2023	2024
68	86	93	95	73	98	98	93

Samples Successfully Collected and Analyzed in 2024 by Filter Type. PTFE: 113 (92.6%), Nylon: 114 (93.4%), Quartz: 114 (93.4%)

The plots below show temporal trends for site 35-015-3001 alongside network-wide CSN and IMPROVE median concentrations. The top plot shows the variability of the reconstructed fine mass (RFM) concentrations during 2024; RFM can only be calculated if all three filters collected on a sampling day are valid. The bottom plot illustrates the long-term trends of ambient concentrations; the gray shaded region represents the range of values measured each year at this site, illustrated using the 10^{th} and 90^{th} percentile values.

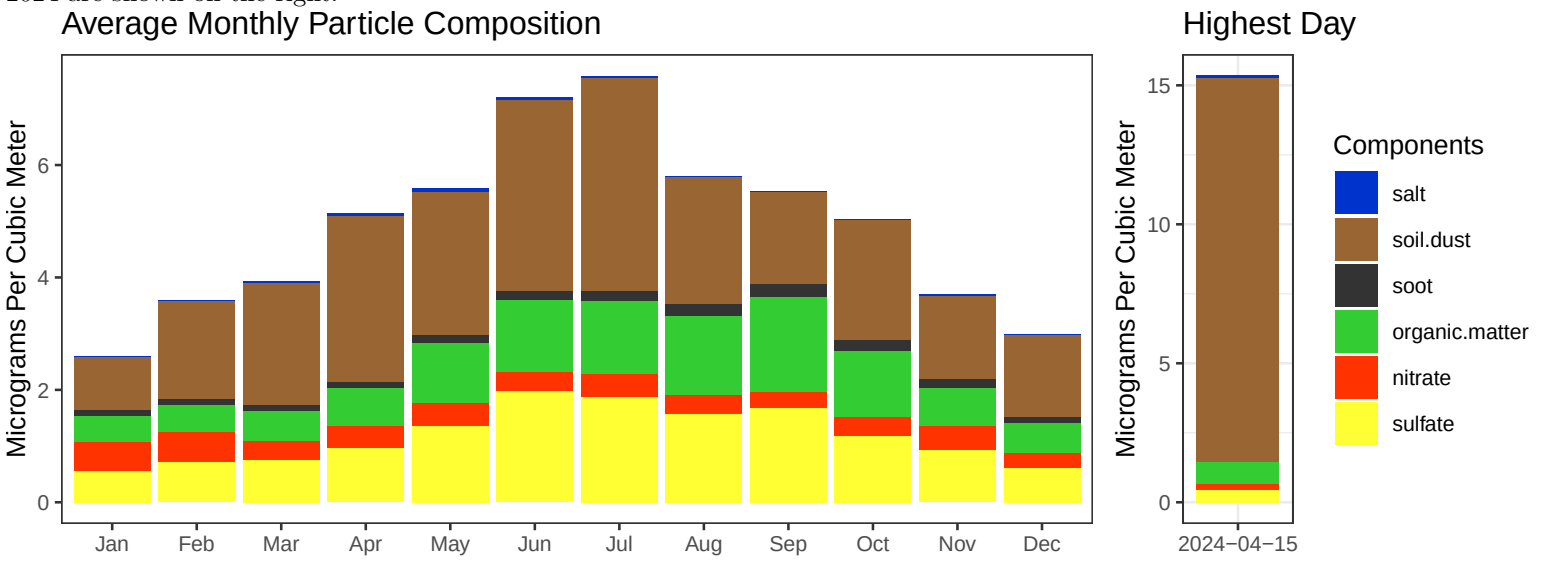




More Information

To view and download IMPROVE data, you can visit: https://www.epa.gov/outdoor-air-quality-data
Univ. of California, Davis website with information about current research and publications: https://aqrc.ucdavis.edu/
The Colorado State Univ. website with data resources, literature, and visibility overviews: http://vista.cira.colostate.edu/Improve/
EPA website with guidance and background documents: https://www.epa.gov/amtic/chemical-speciation-network-csn
Real-time air monitoring data for the United States: https://www.airnow.gov/

The following plots summarize the chemical composition of particles collected at this site. The monthly averaged compositions calculated from 2020-2024 data are shown on the left while compositions for the day with the highest measured concentrations during 2024 are shown on the right.



Components	Calculation	Natural Sources	Anthropogenic Sources
Salt	$1.8 \cdot Chloride$	Ocean spray, dry lakebeds	Chemical manufacturing, lake consumption
Soil Dust	$2.2 \cdot Al + 2.49 \cdot Si + 1.63 \cdot Ca + 2.42 \cdot Fe + 1.94 \cdot Ti$	Soil resuspension, dust storms long-range transport	Construction, agriculture, deforestation, unpaved roads
Soot	$Elemental\ Carbon$	Wildfires	Motor vehicles, wood burning, smoking
Organic Matter	$1.4 \cdot Organic\ Carbon$	Plants, animals, wildfires	Motor vehicles, cooking oils, household cleaners
Nitrate	$1.29 \cdot Nitrate$	Plants, animals	Fertilizer, stock yards, chemical manufacturing
Sulfate	$4.125 \cdot Sulfur$	Volcanism	Coal-fired power plants, chemical manufacturing

The following map shows the average RFM concentrations for nearby sites in both CSN and the rural IMPROVE Network. The point shapes indicate which network the sites are associated with. The color bar indicates the average annual RFM concentration (micrograms per cubic meter) measured at each site in 2024.