



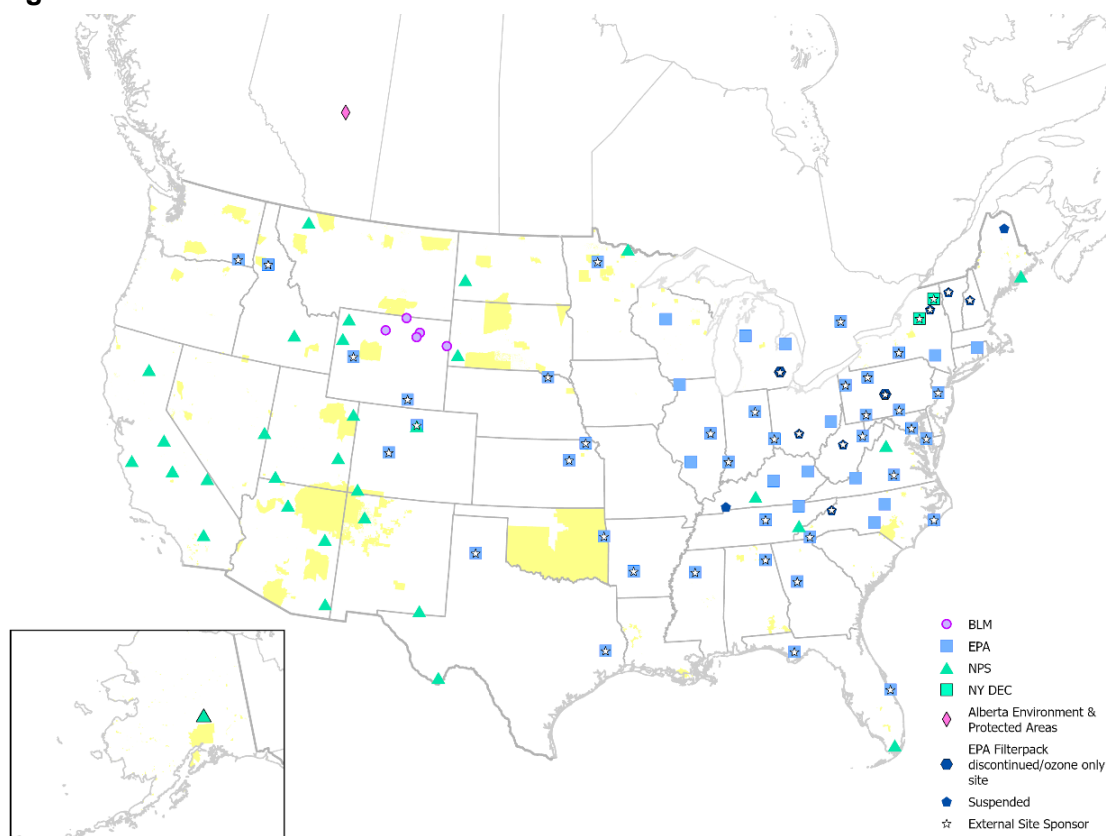
Snapshot of 2022 CASTNET Data

The Clean Air Status and Trends Network (CASTNET) is a cross-agency, multipollutant air quality network that provides data to support federal and state monitoring requirements, characterize regional and global transport of air pollutants, and assess long-term air quality trends. Monitoring sites are located primarily in rural areas across the United States to fill critical spatial gaps in the nation's air quality network. Several agencies manage and operate the network, including the U.S. Environmental Protection Agency (EPA), National Park Service, Bureau of Land Management, and U.S. Forest Service, in cooperation with Tribal Nations and several state agencies. While the network strives to maintain a consistent data record to assess long-term trends, the program has also evolved to address new priorities and emerging data needs. This summary provides a snapshot of key network highlights from 2022, including maps and trends developed from CASTNET observations through 2022. Additional maps and graphs are available on the CASTNET website: <https://www.epa.gov/castnet/>.

Key Network Highlights from 2022

- The Santee Sioux Tribe (SAN189, NE) suspended CASTNET filter pack and National Atmospheric Deposition Program (NADP) sampling in April 2022. Sampling resumed in October 2022. The site continued to report ozone (O₃) data during this period.
- EPA suspended sampling at several CASTNET and NADP sites in May 2022. All sampling was suspended at the following sites: Ashland, ME (ASH135); Cadiz, KY (CDZ171); Cedar Creek, WV (CDR119); Deer Creek, OH (DCP114); Huntington Wildlife Forest, NY (HWF187); Pisgah National Forest, NC (PNF126); Underhill, VT (UND002); and Woodstock, NH (WST109). Ozone monitoring continued, but filter packs were suspended at Ann Arbor, MI (ANA115) and Penn State, PA (PSU106).
- The Egbert, ON (EGB181) site resumed sampling in June 2022 after one year of site repairs were completed.
- In 2022, EPA's Science Advisory Board (SAB) Staff Office assembled a panel of scientific experts to conduct a review of CASTNET. The panel provided insights into the current value of the program and recommendations to modernize the network and address emerging policy and scientific questions.
- A total nitrogen/water soluble organic nitrogen (WSON) study began in November 2022. Total nitrogen (TN) was analyzed from the Teflon filters at 27 sites for 12 months. WSON was calculated as inorganic nitrogen ammonium (NH₄⁺), nitrate (NO₃⁻), and nitrite (NO₂⁻) subtracted from TN concentrations. A publication summarizing the results will be submitted in 2025.
- The Alhambra, IL (ALH157) site was decommissioned in December 2022. The site operated from 1988 through 2022.

Figure 1 provides a map of the sites that operated during 2022. A detailed description of sites and measurements from each location can be found on the CASTNET [site page](#).

Figure 1. 2022 CASTNET Sites

Air Quality Results Through 2022

After 30+ years in operation, EPA requested a scientific review of the CASTNET program in 2022 to ensure that the data provided by the network continue to meet the needs of the Agency and the American people. As noted, EPA's SAB conducted a thorough review during 2023 and provided a [final report](#) with recommendations in April 2024. The SAB recommendations and feedback from stakeholders, including input from Federal, Tribal, and state agency partners, were used to develop a CASTNET modernization plan, which describes network changes that will achieve cost-savings while re-investing in the highest priority sites and measurements. The CASTNET [modernization plan](#) is publicly available.

Trends in Air Quality

Regional O₃ concentrations are influenced by nitrogen oxide (NO_x) and volatile organic compound (VOC) emissions. Sulfur dioxide (SO₂) emissions contribute to the formation of sulfate (SO₄²⁻), a major contributor to acid rain and a component of fine particle (PM_{2.5}) mass. Total nitrate (particulate nitrate (NO₃) + nitric acid (HNO₃)) and NH₄⁺ also contribute to PM_{2.5} formation and ecological impacts. Federal, state, and local control programs have resulted in substantive reductions in SO₂ and NO_x emissions (e.g., trends in emissions from electric generating units: <https://www.epa.gov/power-sector/progress-report-emissions-reductions>)

and have contributed to the significant improvements in regional air quality (Table 2). CASTNET data continue to provide accountability for Federal and state regulations and critical information to understand impacts on air quality during events such as wildfires and prescribed burns.

Ozone Trends

Trends in ozone concentrations from the eastern and western reference sites are shown in Figure 2. The existing primary and secondary National Ambient Air Quality Standards (NAAQS) for O_3 , established in 2015, are 0.070 parts per million (ppm). To determine compliance with the NAAQS, a design value is calculated using measured O_3 concentrations. The design value is reported as the fourth highest daily maximum 8-hour concentration (DM8A) averaged across three consecutive years. The median fourth highest DM8A O_3 concentration for 2022 at the eastern CASTNET reference sites was 61 parts per billion (ppb). At the western CASTNET reference sites, the median was 64 ppb. The most recent 3-year period for calculated design values (2020–2022) resulted in several locations at or above the NAAQS (Table 1).

Figure 2. Annual trend in the daily maximum rolling 8-hour average ozone concentration from Western and Eastern CASTNET sites

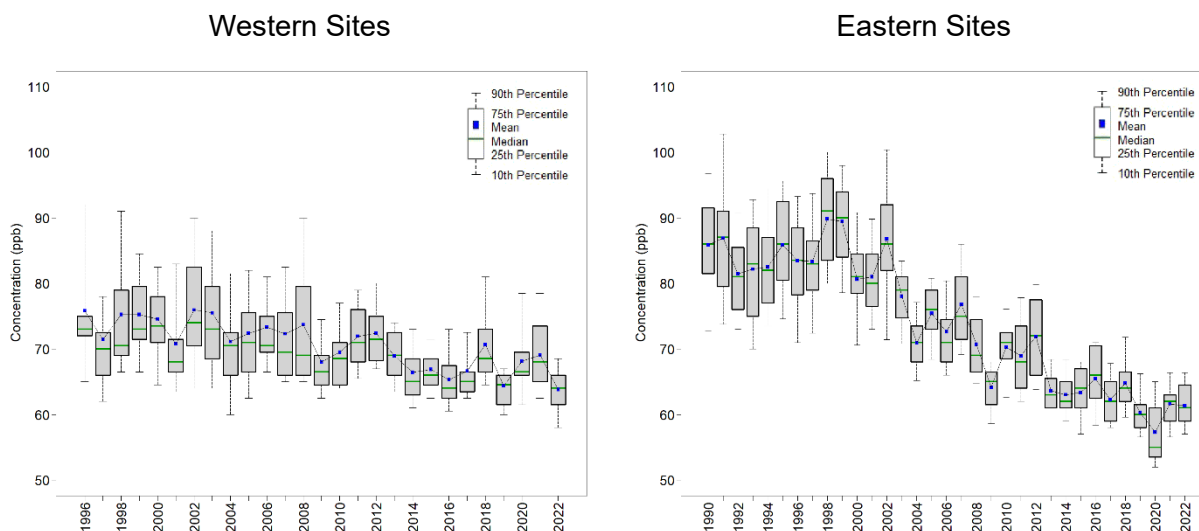


Table 1. CASTNET site locations where the 2020-2022 ozone design values exceeded the 2015 NAAQS

Site ID	Site Name	State	Ozone Design Value
CAV436	Carlsbad Caverns National Park	NM	78 ppb
DEV412	Death Valley National Park	CA	71 ppb
DIN431	Dinosaur National Monument	UT	76 ppb
JOT403	Joshua Tree National Park	CA	79 ppb
ROM406	Rocky Mountain National Park	CO	70 ppb
SAN189	Santee Sioux Tribe	NE	71 ppb
SEK430	Sequoia and Kings Canyon National Park	CA	88 ppb
YOS404	Yosemite National Park	CA	72 ppb

Filter Pack Trends

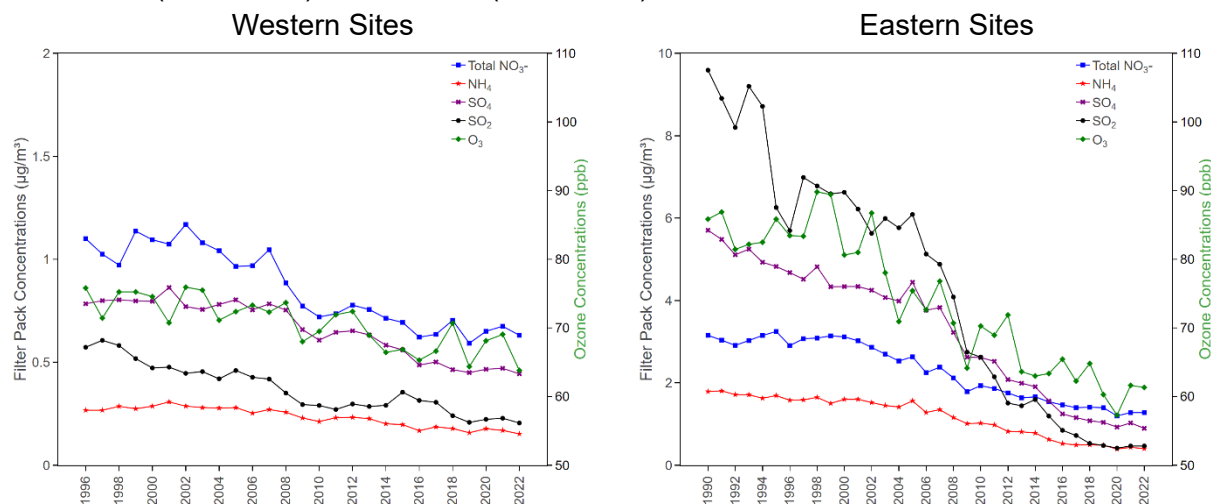
Filter pack measurements help identify trends in air pollutant concentrations. Long-term trends in the Eastern and Western U.S. are shown in Figure 3. The percent change in average concentrations of O₃, total NO₃⁻, SO₂, SO₄²⁻, and NH₄⁺ from 1996 through 2022 for the western sites and 1990 through 2022 for the eastern sites are summarized in Table 2. Significant reductions in air pollution have been realized throughout the U.S. Trends from each monitoring location can be found on the [individual CASTNET site pages](#).

Table 2. Average Concentrations and Percent Changes realized at Western and Eastern CASTNET sites

Pollutant	Western Reference Sites		Eastern Reference Sites		Percent Change	
	1996-1998	2020-2022	1990-1992	2020-2022	West	East
4th Highest DM8A O ₃ Concentration (ppb)	74	67	85	60	-10	-29
Total NO ₃ (µg/m ³)	1.0	0.7	3.0	1.3	-37	-59
SO ₂ (µg/m ³)	0.6	0.2	8.9	0.5	-63	-95
SO ₄ ²⁻ (µg/m ³)	0.8	0.5	5.4	0.9	-42	-83
NH ₄ ⁺ (µg/m ³)	0.3	0.2	1.8	0.4	-39	-77

Note: Reference sites are long-term sites that have a consistent data record over the defined period.

Figure 3. Trends in concentrations from CASTNET filter pack sites located in the Western (1996-2022) and Eastern (1990-2022) United States.



Note: The left and right y-axes are on different scales.

Maps from 2022

The regionally distributed CASTNET sites provide air quality information beyond the urban or suburban areas where most state and local monitors are placed. The CASTNET data provide important insight into how interstate and international pollution transport impacts rural and upwind communities. Air pollution that is deposited to the earth's surface can negatively impact sensitive ecosystems, crop yields, and forest health. CASTNET filter pack data are used to calculate the amount of air pollution deposited to the surface ("atmospheric deposition"). A series of concentration and deposition maps can be found on the [CASTNET website](#).

Maps of ambient concentrations of SO_2 from 2000-2002 and 2020-2022 are shown in Figure 4, and maps of total sulfur deposition over the same time periods are shown in Figure 5. These are examples of the individual maps provided on the website.

Figure 4. Ambient concentrations of SO₂ as measured at CASTNET sites from 2000-2002 (left) and 2020-2022 (right)

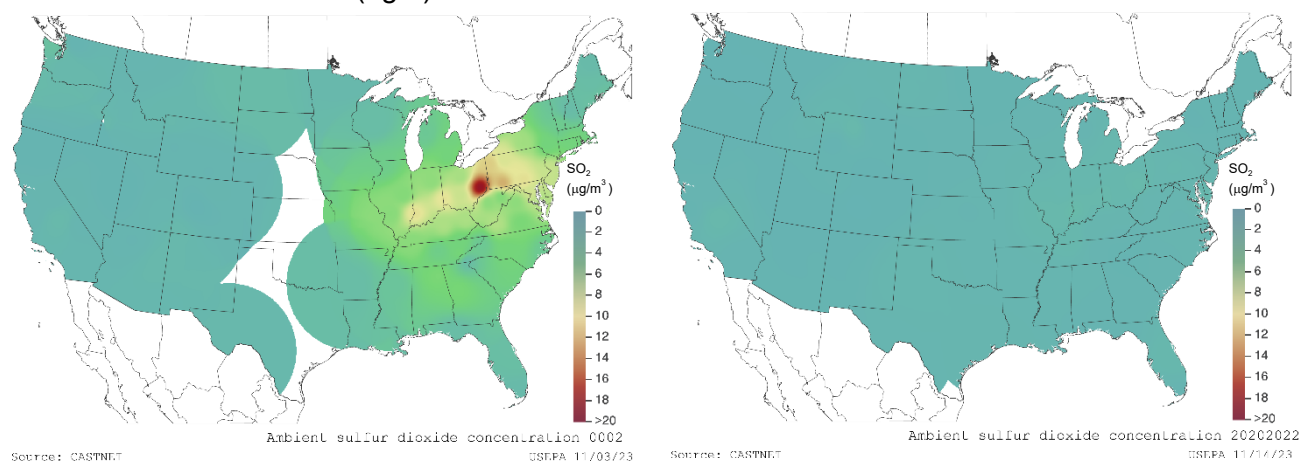
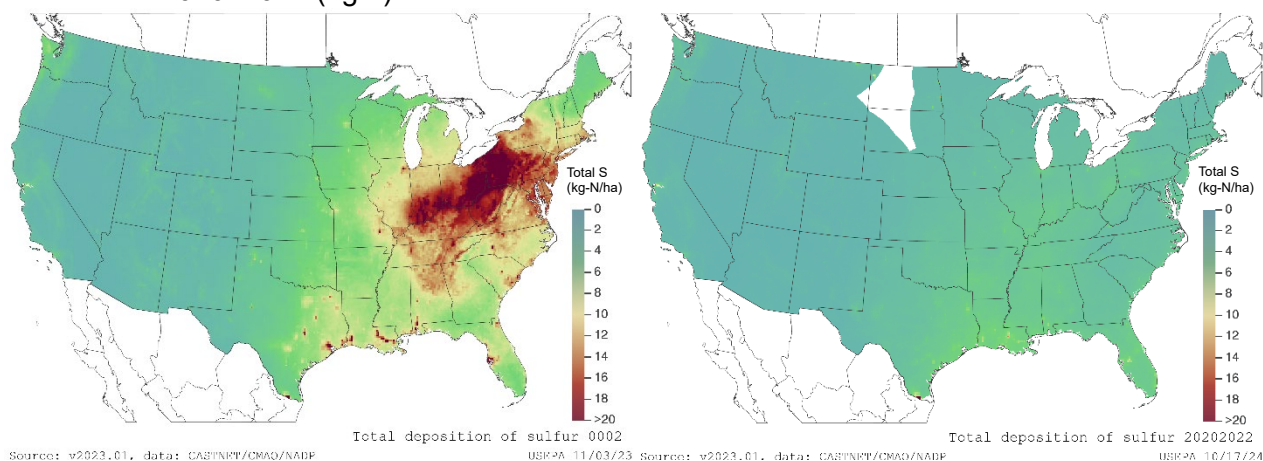


Figure 5. Total (Wet + Dry) Atmospheric Sulfur Deposition from 2000–2002 (left) and 2020–2022 (right)



Over the past three decades (1990–2022), air quality across the U.S. has improved significantly. CASTNET remains a vital tool for regulatory programs and provides long-term, transparent data to monitor changes in air pollution and assess environmental impacts. By tracking trends in air quality, CASTNET helps ensure accountability and supports ongoing efforts to protect public health and ecosystems.

Additional Resources

EPA routinely updates the CASTNET website with new information and data summaries. For more details on the program visit the resources provided below:

CASTNET homepage: <https://www.epa.gov/castnet>

CASTNET locations with links to site data: <https://www.epa.gov/castnet/castnet-site-locations>

Annual maps: <https://www.epa.gov/castnet/maps-charts>

Summary reports and quality assurance information: <https://www.epa.gov/castnet/documents-reports>

EPA's air monitoring programs: <https://www.epa.gov/amtic>

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