

NADP National Trends Network (NTN)

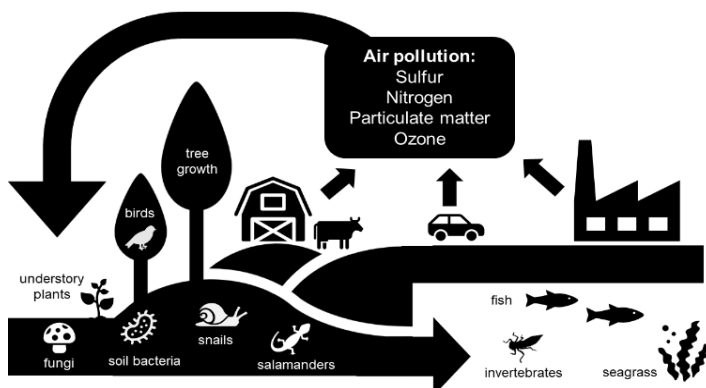
The National Atmospheric Deposition Program (NADP) [National Trends Network \(NTN\)](#) has ~250 sites that measure inorganic precipitation chemistry in weekly samples to track deposition of acid rain constituents. The National Park Service has 35 NTN collectors and rain gauges in parks to help understand risk to ecosystems and to provide data to guide management decisions. Samples are collected every Tuesday and sent to the NADP Analytical Laboratory for analysis, data entry, verification, screening, and posting to the NADP website.

This report summarizes 2024 weekly deposition data and trends in annual deposition data from 2018–2024. It also provides information on whether or not the annual data meet quality assurance criteria to calculate an accurate estimate of total deposition. Justifications for samples labeled as invalid are included to help guide future site management.

Why NADP data matters

Air pollution affects the smallest microbes, the largest trees, and everything in between. For example, on land nitrogen pollution changes competition between understory plants. Animals may struggle to find food when important native understory plants decline. Nitrogen and acid deposition also affect soil health and chemistry which can, among other things, slow the growth of snails, impacting a food source for many birds and salamanders.

Air pollution washes into streams and rivers, where it can kill aquatic invertebrates and fish. Air pollution also washes into the sea where nitrogen pollution can cause toxic algal blooms that can kill seagrasses that serve as fish nurseries. To understand the risk to known sensitive resources in your park, please explore the [NPS ARD Conditions and Trends](#) page.



Deposition figures

This report summarizes weekly deposition values (2024) and annual deposition trends (2018–2024) for ammonium (NH_4^+), nitrate (NO_3^-), and sulfate (SO_4^{2-}) deposition, while providing annual data for other analytes (Table 1). Longer trends are available on the [NPS ARD Conditions and Trends](#) page.

Figures 1, 3, and 5 show deposition data from weekly samples collected in 2024. The black circles indicate the amount of deposition collected during a week-long period. The blue line in the background shows the amount of precipitation during the sample week. If there is a red circle on the line, it means the week's sample is invalid.

Figures 2, 4, and 6 show the trend of annual deposition from 2018–2024. The graph follows the same color scheme as above except that a red dot indicates a year of data that does not meet the Completeness Criteria.

Completeness Criteria

In order for a site to be included in the NADP annual data summary map, three different criteria need to be met. These Completeness Criteria ensure that a high enough percentage of recorded precipitation is collected to make an accurate estimate of total pollutant deposition.

The Completeness Criteria section of this report shows the percentage of the weekly samples that meet each standard from 2018–2024 (Table 2). If the Completeness Criteria are not met, it is usually due to conditions at the site or issues with the sampler.

Invalid samples

Weekly samples can be classified as invalid for various reasons, including contamination from birds, insects, or wind-blown debris. Other common reasons include failure of the collector to open or failure of the rain gauge to measure precipitation accurately.

This report provides two summaries of invalid data. The first provides the justification for each weekly sample classified as invalid, enabling identification of within-year patterns and potential seasonal influences on data quality (Figure 7). The second shows the count of each invalid code from 2018–2024 (Table 3), allowing assessment of the consistency of issues over time (and across sites) to identify patterns and inform potential network-wide solutions.

Agency: NPS Park: Katmai National Park
Site: AK97 Site name: King Salmon
Year: 2024 Network: NTN

A summary of weekly deposition values for nitrogen and sulfur compounds sampled by NADP-NTN collectors and the trend of total deposition from 2018–2024. The rank represents the air quality from least (1) to most (35) deposition within NPS sites.

Total NH₄ Deposition: 0.08 kg-N ha⁻¹ yr⁻¹ Rank: 2/35

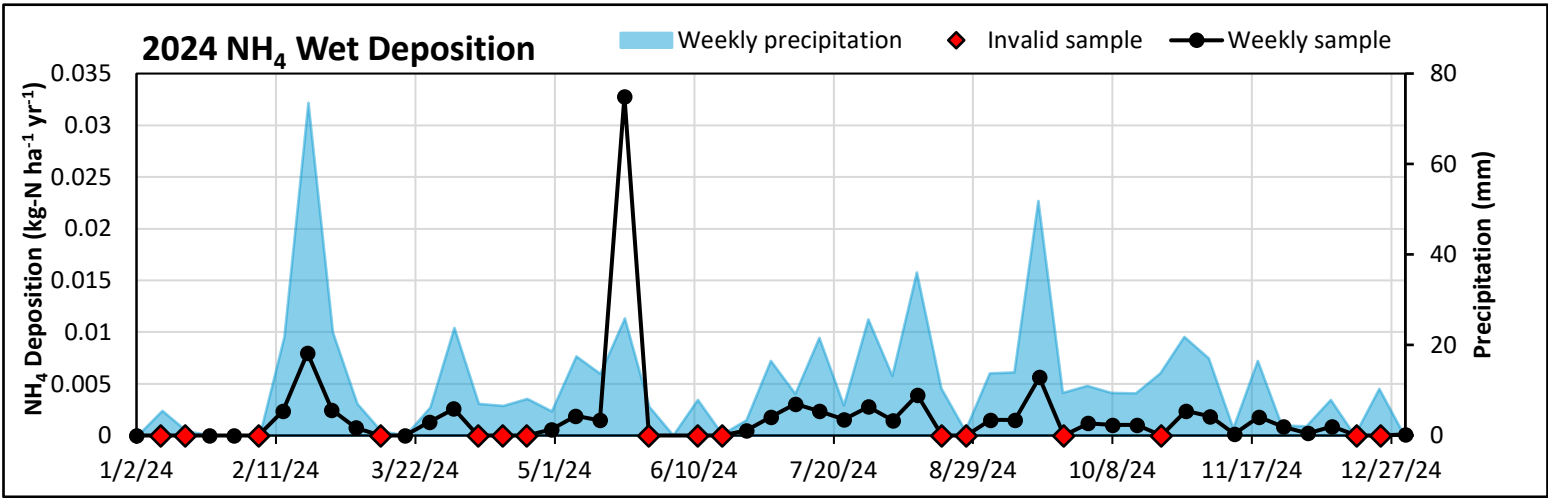


Figure 1. Weekly wet deposition of NH₄ ions (concentration x precipitation) measured in the NTN sample.

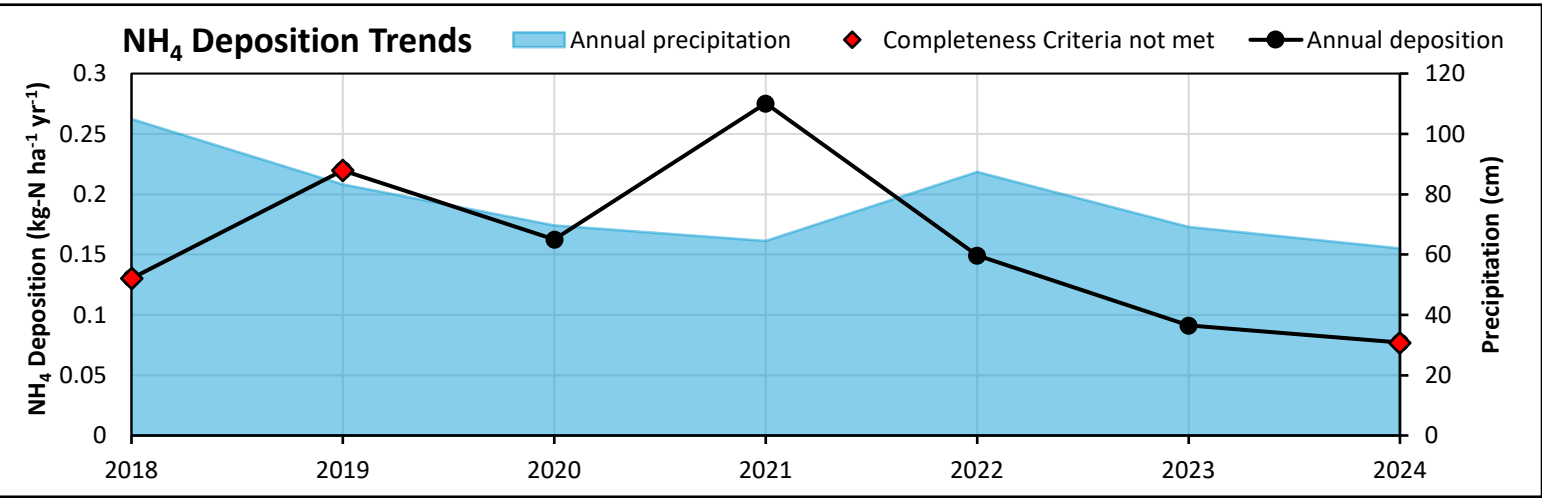


Figure 2. Annual wet deposition of NH₄ ions (concentration x precipitation) measured in the NTN sample.

Total NO₃ Deposition: 0.18 kg-N ha⁻¹ yr⁻¹ Rank: 4/35

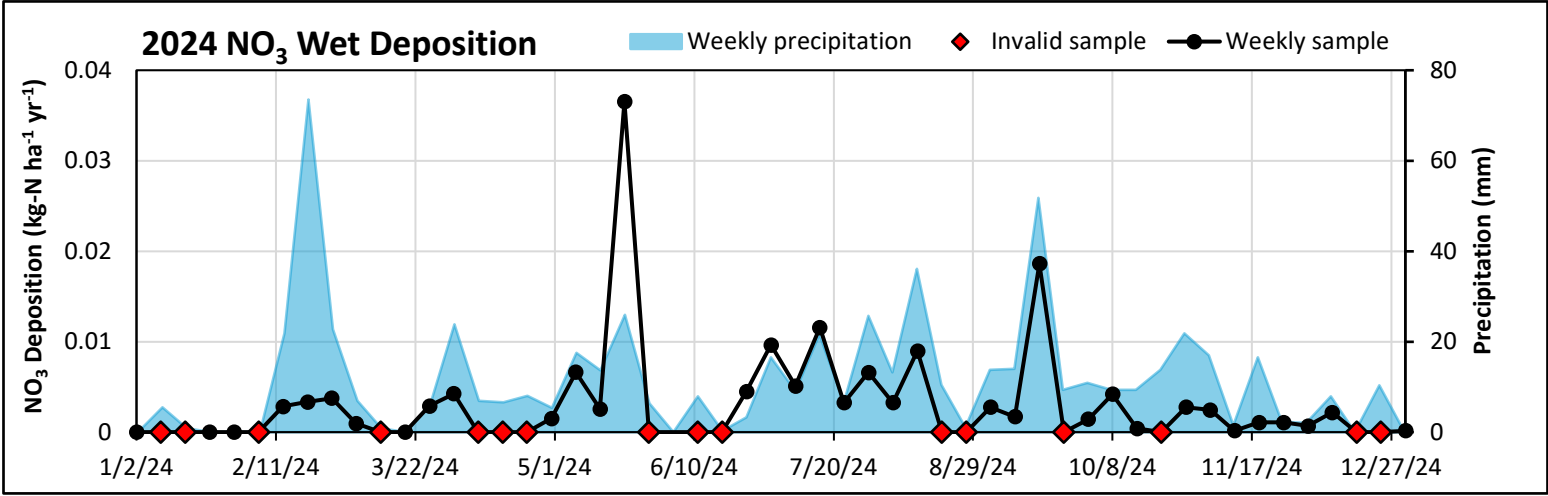


Figure 3. Weekly wet deposition of NO₃ ions (concentration x precipitation) measured in the NTN sample.

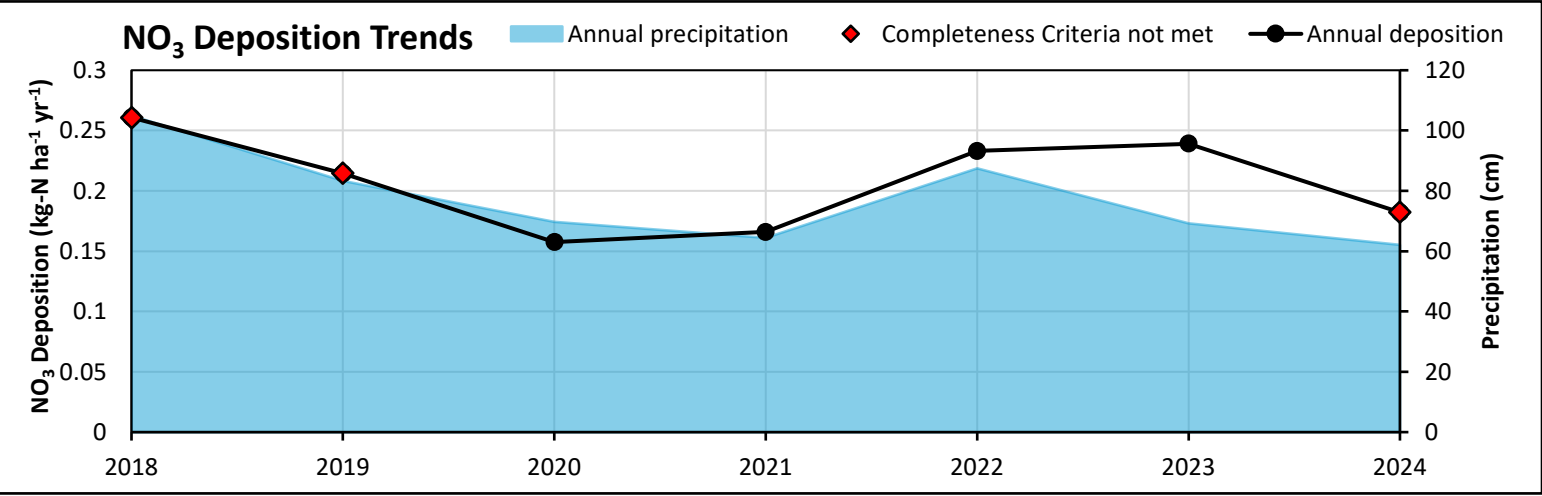


Figure 4. Annual wet deposition of NO₃ ions (concentration x precipitation) measured in the NTN sample.

Total SO₄ Deposition: 1.72 kg-S ha⁻¹ yr⁻¹ Rank: 24/35

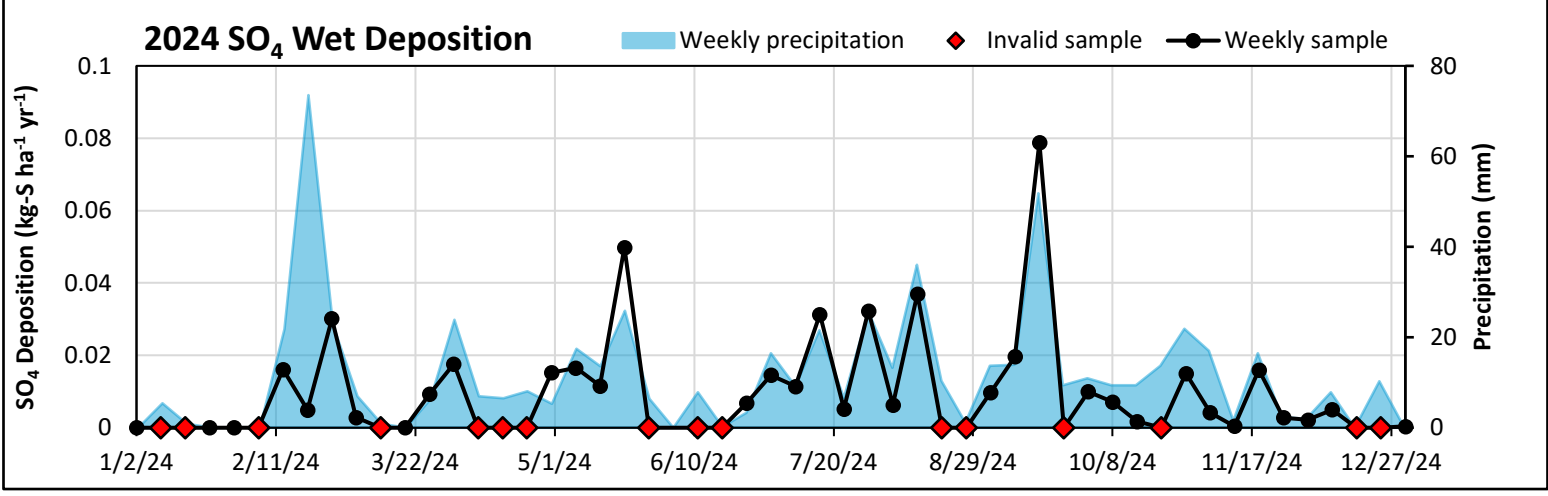


Figure 5. Weekly wet deposition of SO₄ ions (concentration x precipitation) measured in the NTN sample.

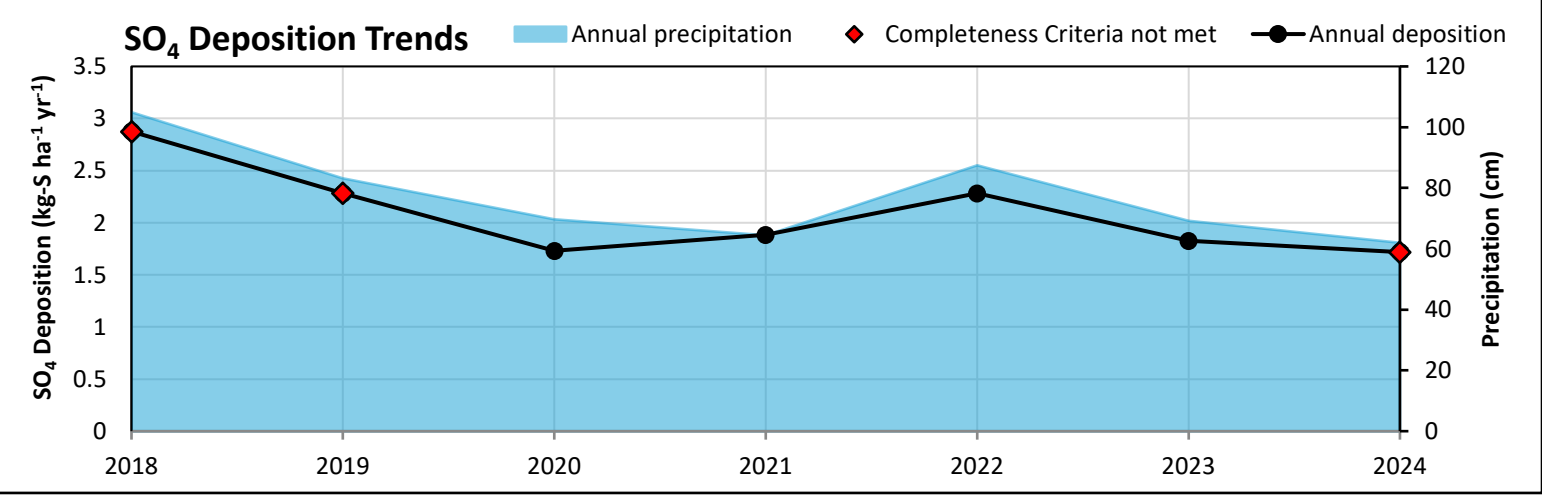


Figure 6. Annual wet deposition of SO₄ ions (concentration x precipitation) measured in the NTN sample.

Agency: NPS

Park: Katmai National Park

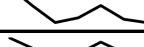
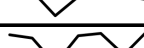
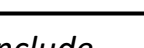
Site: AK97

Site name: King Salmon

Year: 2024

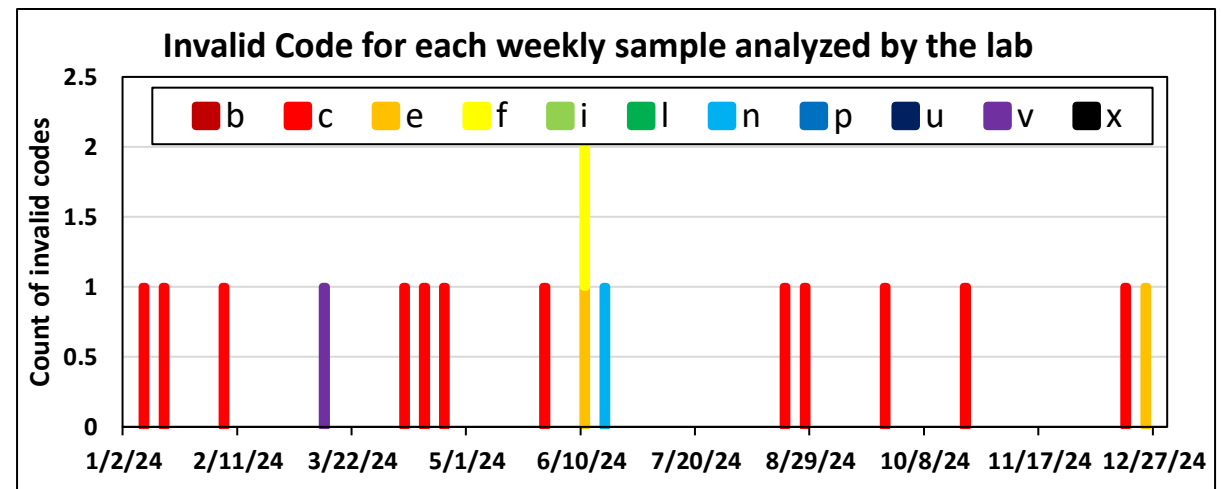
Network: NTN

Additional Deposition Data*Annual deposition values of all ions collected in NADP NTN samplers for last six years.***Table 1.** Annual sum of deposition of measured ions within the NTN collector (kg ha⁻¹ yr⁻¹), mean pH, and bulk precipitation (cm).

Deposition Type	2018	2019	2020	2021	2022	2023	2024	Trends
Ammonium	0.13	0.22	0.16	0.28	0.15	0.09	0.08	
Nitrate	0.26	0.21	0.16	0.17	0.23	0.24	0.18	
Total N	0.39	0.43	0.32	0.44	0.38	0.33	0.26	
Sulfate	2.88	2.28	1.73	1.88	2.28	1.83	1.72	
Calcium	0.30	0.27	0.17	0.24	0.29	0.25	0.24	
Magnesium	0.23	0.22	0.10	0.23	0.24	0.15	0.24	
Potassium	0.13	0.16	0.10	0.12	0.16	0.13	0.11	
Sodium	1.96	1.92	0.91	1.82	2.08	1.22	1.96	
Chloride	3.90	3.71	1.85	3.49	4.10	2.41	3.91	
pH	5.67	5.71	5.74	5.82	5.87	5.84	5.94	
Precipitation (cm)	104.93	83.27	69.73	64.47	87.42	69.17	62.03	

Completeness Criteria*Three Completeness Criteria form the basis for the decision to include the laboratory chemistry data from a site in the Annual Isopleth Maps.***Table 2.** Annual values for each of the three NADP sampling criteria. All three criteria must be met for data to be valid.

	2018	2019	2020	2021	2022	2023	2024	Trends
Criteria 1	79	74	78	86	82	77	72	
Criteria 2	95	100	99	99	99	99	99	
Criteria 3	74	81	79	100	83	82	86	
Criteria Met	No	No	Yes	Yes	Yes	Yes	No	

Criteria 1 - Percentage of the summary period for which there are valid samples. (>75%)**Criteria 2** - Percentage of the summary period for which precipitation amounts are available either from the rain gage or from the sample volume. (> 90% precipitation amounts)**Criteria 3** - Percentage of the total measured precipitation associated with valid samples. (>75% of the total precipitation).**Criteria Met** - All three Completion Criteria standards have been met and the data and the annual data summary is valid.**Invalid sample description***Samples that are considered invalid by NADP/NTN when calculating annual estimates.***Figure 7.** Invalid code for each 2024 weekly NTN sample.**Table 3.** Annual sum of invalid codes for weekly samples received by NADP.

Invalid code	2018	2019	2020	2021	2022	2023	2024
b	0	0	1	0	0	0	0
c	6	9	11	5	5	12	12
e	0	2	1	1	2	0	2
f	0	0	0	0	0	0	1
i	0	0	0	0	0	0	0
l	0	0	0	0	0	0	0
n	0	0	0	0	0	0	1
p	1	0	0	0	0	0	0
u	2	0	0	0	0	0	0
v	1	0	3	1	2	0	1
x	0	0	0	0	0	0	0
Total	9	10	15	7	9	12	16

b - bulk sample (collector was open the entire sampling period)**c** - contaminated sample**e** - extended sampling period >194 hrs. (8 days, 2 hours)**f** - field protocol error or extended field hold time (sample receipt >60 days after OFF date)**i** - low volume (diluted) sample**l** - lab error (major handling problems in lab)**n** - no sample submitted**p** - precipitation value unknown (no precipitation data from rain gage or alternate source)**u** - undefined sample (sample exposed for at least 6 hours without precipitation)**v** - precipitation amount indicates sufficient sample volume, but insufficient sample in bottle for analysis**x** - reasons other than described above