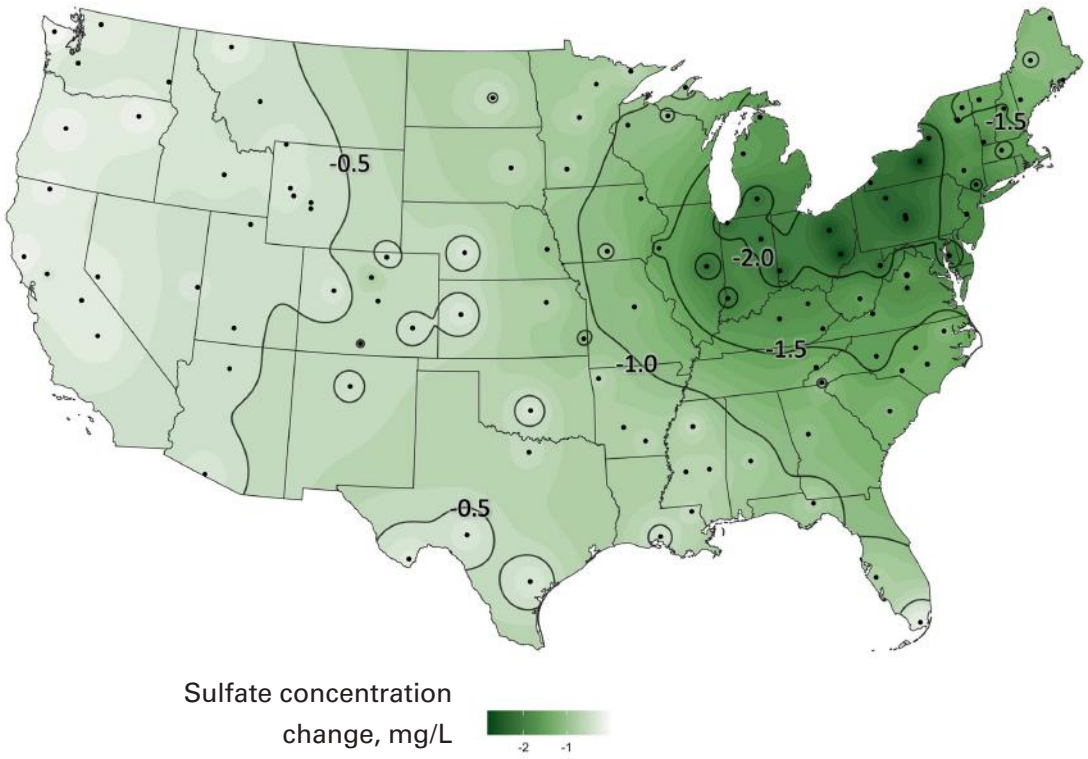
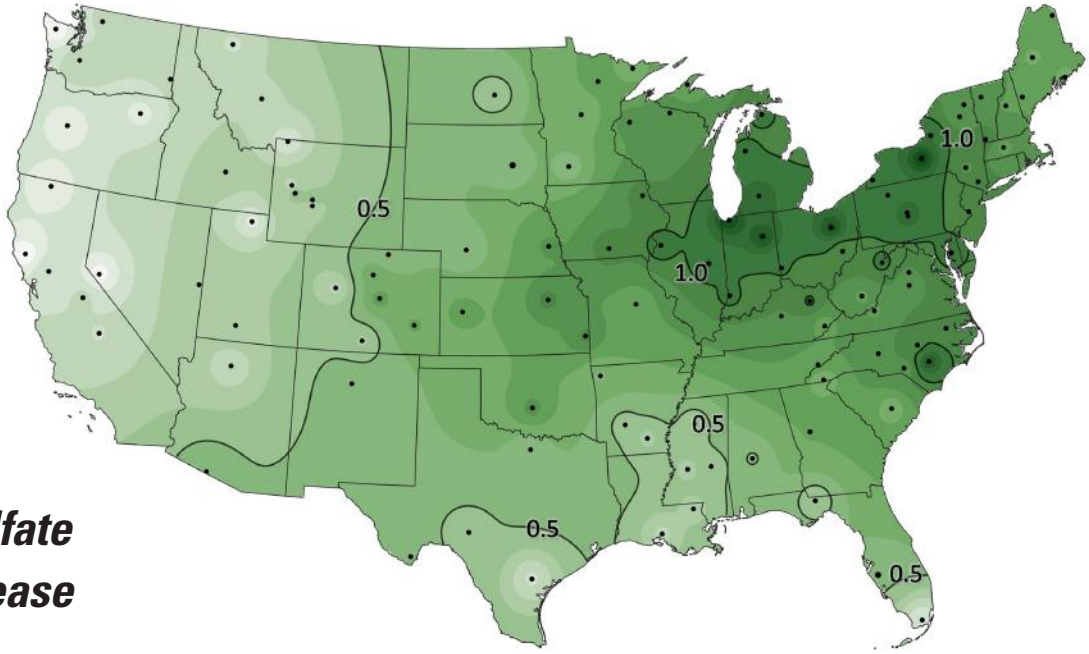
National Atmospheric Deposition Program

# 2021 Annual Summary



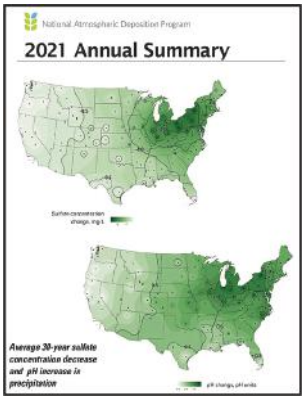




***Average 30-year sulfate concentration decrease and pH increase in precipitation***

On the cover: These two maps represent the measurement difference in sulfate ion concentration (upper) and pH (lower) over a 30-year period. Each map was constructed in the following manner:

For the period 1989, 1990, and 1991, the arithmetic average of the 3 annual precipitation weighted values were determined for each constituent and site. The same was computed for the later period of 2019, 2020, and 2021. Only sites with at least 2 early years and at least 2 later years were included in these averages. The difference between the later years grand average and the early years grand average was computed for each site.

These resulting differences were computed for each site for pH (pH units) and for sulfate ion (mg/L precipitation). All resulting differences were plotted over space using NADP basic techniques, resulting in these two maps showing very similar patterns.




*When referencing maps or information in this report, please use the citation: National Atmospheric Deposition Program, 2021. National Atmospheric Deposition Program 2021 Annual Summary. Wisconsin State Laboratory of Hygiene, University of Wisconsin-Madison, WI.*

# Contents

# 2021 Highlights

The National Atmospheric Deposition Program (NADP) provides high-quality, robust measurements that support informed decisions about environmental and public health issues as they relate to atmospheric deposition chemistry, and advance our understanding of atmospheric processing through the measurement of gaseous ammonia and mercury. NADP data is relevant to scientists, educators, policymakers, and the public. All data is available without charge on the NADP website (http://nadp.slh.wisc.edu).

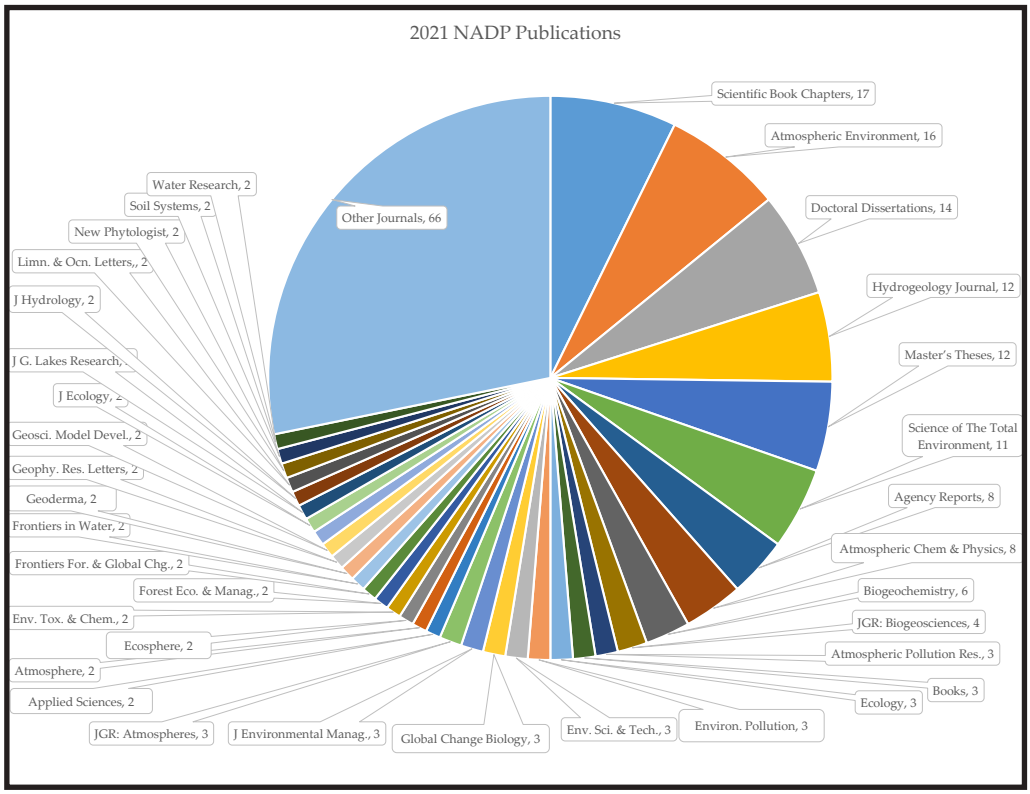
The NADP is composed of five networks, including the National Trends Network (NTN), the Mercury Deposition Network (MDN), the Atmospheric Mercury Network (AMNet), the Ammonia Monitoring Network (AMoN), and the Mercury Litterfall Network (MLN). The table below summarizes the number of measurements from each network in 2021. The MLN was added in this year.

**Summary of 2021 Network Measurements**

| Network | Measurements | Period | No. of sites |
|---|---|---|---|
| NTN | 13,002 | weekly | 268 |
| MDN | 4,052 | weekly | 82 |
| AMNet | 41,362 | hourly/ 2-hourly | 11 |
| AMoN | 3,922 | two week | 112 |
| MLN | 23 | seasonal | 23 |

**Highlights:**

- During the calendar year, 224 articles/reports were identified as having used NADP data. These include:
  - 14 doctoral dissertations
  - 12 master's theses
  - 5 agency/institute reports



- With the Aeroallergen Monitoring Science Committee (AMSC), several scientists began testing to determine if NTN wet deposition samples are appropriate collections for the determination of atmospheric pollen concentrations. The observations were compared to traditional pollen concentrations determined by the National Allergy Board and the new PollenSense automated sampler. Results will be available soon.
- The Mercury Litterfall Network, originally with the U.S. Geological Survey (USGS, Mercury Litterfall Initiative), was accepted as a full NADP network by a motion of the Executive Committee at the Spring Meeting. During 2021, 23 sites operated and collected samples.
- **UPDATE:** The long lifespan of the Belfort mechanical precipitation gages continues, but is down to the LAST TWO BELFORTS. MI99 and MS19 are the final two sites operating these, and both are scheduled to be removed very soon. Additionally, fewer personal digital assistants (PDAs) are being used by sites, with only 20 or so PDAs still in use.
- Officers for the Federal Year 2021
  - Chair: Greg Wetherbee, USGS
  - Vice Chair: John Walker, USEPA
  - Secretary: Linda Geiser, USDA–FS
  - Past Chair: David Schmeltz, USEPA
- Over the entire year, U Of Wisconsin-Madison and NADP staff completely rebuilt and updated the NADP website (https://nadp.slh.wisc.edu), from top to bottom. We hope that the new website will make data and information retrieval much more straightforward, and convenient.


# *In Memoriam*

During the year, NADP lost two important contributors to our network.

Dr. Ellis B. Cowling was one of the originators of the NADP and a longtime supporter of the network, a friend to all, and an accomplished scientist in the environmental/acid rain area.

John "Jack" Beach was also a very good friend of the network, and designed and built the NCON sampler that most of sites use to collect their wet deposition samples.

The NADP is a much better organization due to their commitment. May they both *requiescat in pace*.

***Dr. Ellis B. Cowling***

***Mr. John "Jack" Beach***

# NADP Background

The NADP was established in 1977 under State Agricultural Experiment Station (SAES) leadership to address the problem of atmospheric deposition, and its effects on agricultural crops, forests, rangelands, surface waters, and other natural and cultural resources. The NADP's primary charge was to provide data on the temporal trends and geographic distribution of the atmospheric deposition of acids, nutrients, and base cations by precipitation. In 1978, sites in the NADP precipitation chemistry network first began collecting weekly, wet-only deposition samples. Chemical analysis was performed at the Illinois State Water Survey's Central Analytical Laboratory (CAL), located at the University of Illinois at Urbana-Champaign and the Program Coordinator was housed at Colorado State University.

Initially, the NADP was organized as SAES North Central Regional Project NC-141, which all four SAES regions further endorsed in 1982 as Interregional Project IR-7. A decade later, IR-7 was reclassified as the National Research Support Project No. 3 (NRSP-3), which it remains to this day. NRSP projects are multistate activities that support research on topics of concern to more than one state or region of the country. Multistate projects involve the SAES in partnership with the USDA National Institute of Food and Agriculture (NIFA) and other universities, institutions, and agencies.

In October 1981, the federally-supported National Acid Precipitation Assessment Program (NAPAP) was established to increase our understanding of the causes and effects of acidic precipitation. This program sought to establish a long-term precipitation chemistry network of sampling sites away from point source influences. Building on its experience in organizing and operating a national-scale network, the NADP agreed to coordinate operation of NAPAP's National Trends Network. Later, to benefit from identical siting criteria, operating procedures, and a shared analytical laboratory, NADP and NTN merged with the designation NADP/NTN. This merger brought substantial new federal agency participation into the program. Many NADP/NTN sites were supported by the USGS, NAPAP's lead federal agency for deposition monitoring.

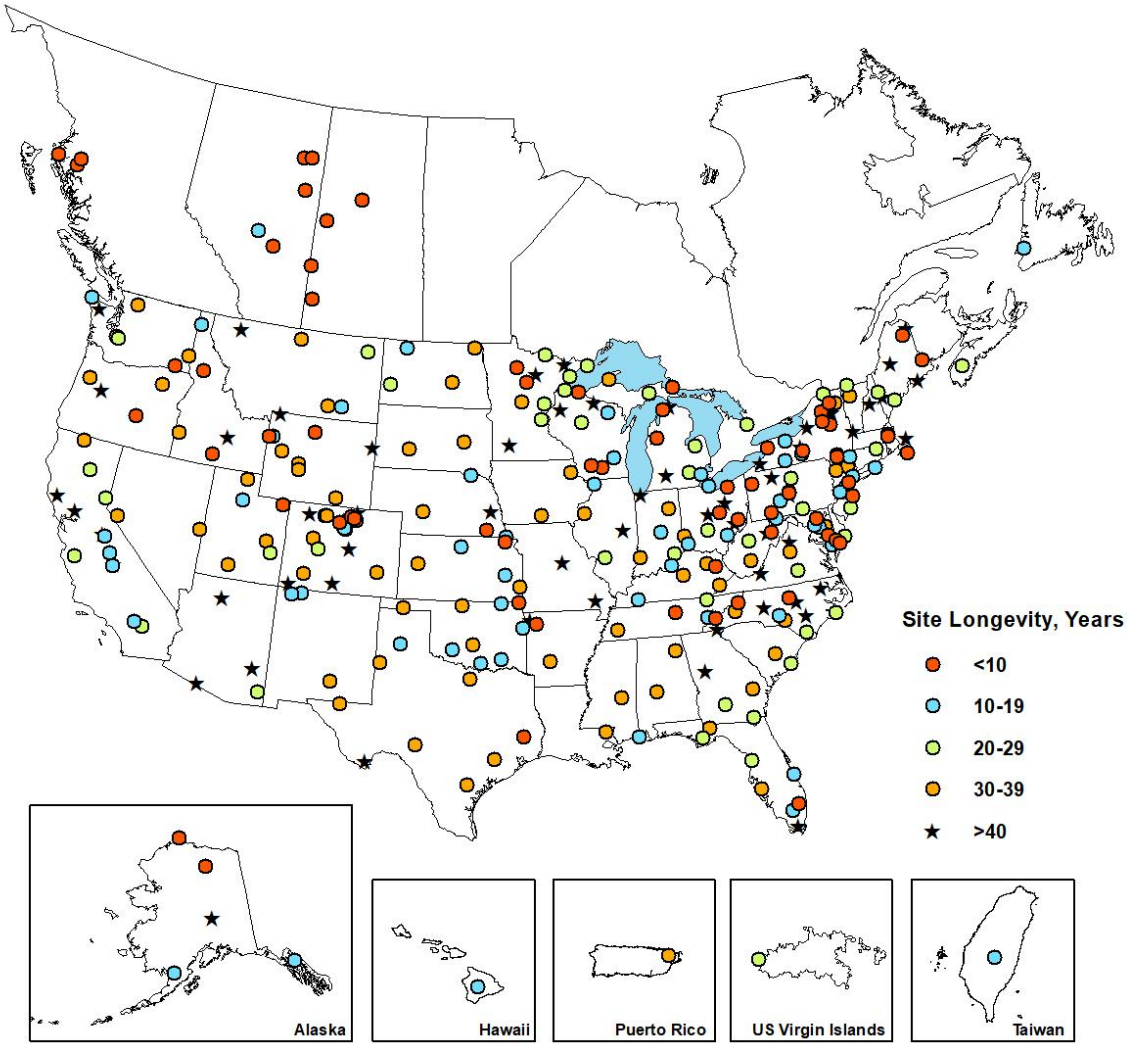
In October 1992, the AIRMoN was formed from the Multistate Atmospheric Power Production Pollution Study (MAP3S), which was operated by the Department of Energy and NOAA. MAP3S measured wet deposition and estimated dry deposition (later discontinued) for the same analytes. AIRMoN sites collect samples daily when precipitation occurs, and are analyzed for the same analytes as NTN samples.

In January 1996, the NADP established the MDN, the third network in the organization. The MDN was formed to provide data on the wet deposition of mercury to surface waters, forested watersheds, and other receptors. MDN samples, like NTN samples, are weekly collections.

In October 2009, AMNet joined the NADP as its fourth network. AMNet measures the concentration of atmospheric mercury at high-time resolution using on-site, real-time analyzers.

In October 2010, AMoN joined the NADP. Atmospheric ammonia concentrations are measured every two weeks using passive samplers. The AMoN furthers the understanding of wet and dry deposition and ammonia partitioning in the atmosphere, allowing better assessment of ecosystem impacts and secondary air pollution formation.

Beginning in late 2017 and completed in mid-2018, the NADP PO and CAL moved from the University of Illinois at Urbana-Champaign to the University of Wisconsin–Madison. In June 2019 the HAL moved to the University of Wisconsin–Madison. Also in 2019, AIRMoN collected its last sample and the network was closed.




**Global distribution and longevity of NADP sites.**

# About the Maps

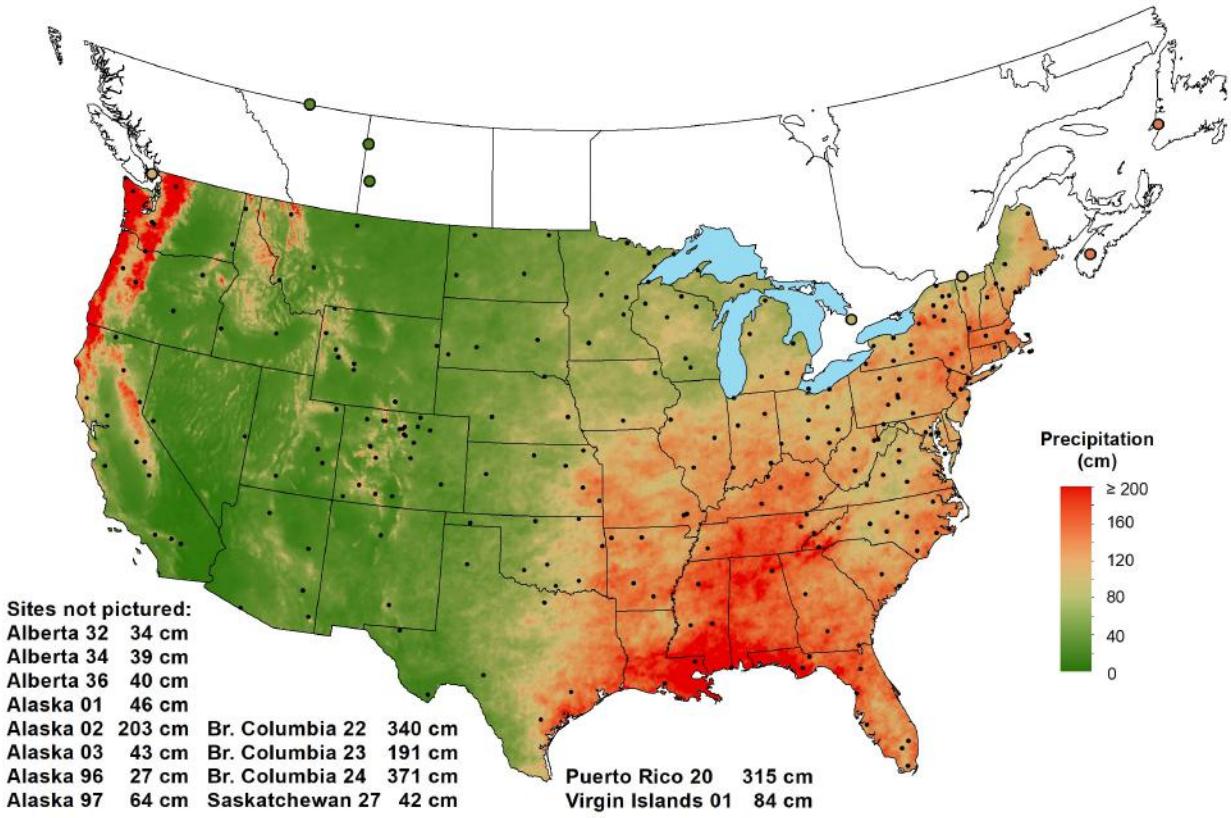
This map series is a principal product of the NADP. It summarizes the results of network operation for the most recent complete calendar year in graphical form. Additional maps, related geographic information, and reviewed analytical results are available on the NADP website.

To be included in a map product, site data must meet strict data completeness criteria (see the NADP website for details). Black dots mark site locations that met NADP completeness criteria in 2021. Open circles designate urban sites, defined as having at least 400 people per square kilometer ($km^2$) within a 15-km radius of the site. Sites (e.g., Canadian sites) that are too far removed from other observations to extend the contour surface also are represented as color- filled circles.

The map contour surface represents a gridded interpolation. Grid points within 500 km of each site are used in computations. Urban sites do not contribute to the contour surface. Colors represent interpolated values of concentration, deposition, or precipitation.

The precipitation surface is a modified version of the U.S. precipitation grid developed by the PRISM Climate Group ("Parameter-elevation Regressions on Independent Slopes Model," http:// prism.oregonstate.edu, data downloaded September 2022). These annual precipitation estimates incorporate point data, a digital elevation model, and expert knowledge of complex climatic extremes to produce continuous grid estimates. NADP precipitation observations are used to supplement the PRISM precipitation grids through an inverse distance weighting within a 20 km radius of each NADP site (see the NADP website for specific information). The resulting precipitation map is used to generate the deposition maps.

The precipitation figure on the next page has a continuous gradient of color from dark green (0 cm of precipitation) to yellow to dark red (greater than 200 cm of precipitation). Concentration and deposition maps follow this same format, with specified units on each map. All maps back to 1985 follow this schema and are available in multiple formats from the NADP website (https://nadp.slh.wisc.edu).




**Total annual precipitation for 2021, using precipitation measurements from the NADP and PRISM (in cm).**

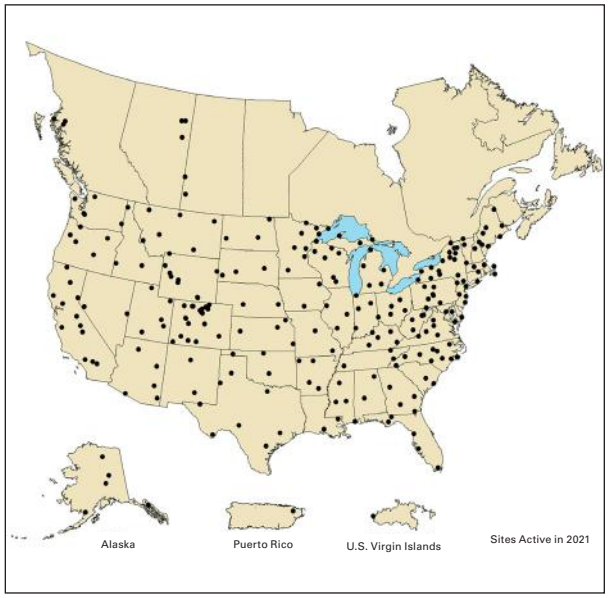
# National Trends Network (NTN)

The NTN is the largest North American network that provides a long-term record of precipitation chemistry. Most sites are located away from urban areas and point sources of pollution, although urban sites do participate. Each site has a precipitation collector and precipitation gage. The automated collector ensures that sampling only occurs during precipitation events. Site operators follow standard operating procedures to help ensure NTN data comparability and representativeness across the network. Weekly samples are collected each Tuesday morning, using containers provided by the CAL.

All samples are sent to the CAL for analysis of free acidity ($H^+$ as pH), specific conductance, calcium ($Ca^{2+}$), magnesium ($Mg^{2+}$), sodium ($Na^+$), potassium ($K^+$), sulfate ($SO_4^{2-}$), nitrate ($NO_3^-$), chloride ($Cl^-$), and ammonium ($NH_4^+$) ions. The CAL quantifies orthophosphate for quality assurance purposes, as an indicator of potential field contamination. The CAL reviews field and laboratory data for accuracy and completeness and flags samples that were mishandled, compromised by equipment failure, or grossly contaminated. Data from the NTN are available on the NADP website (https://nadp.slh.wisc.edu/).

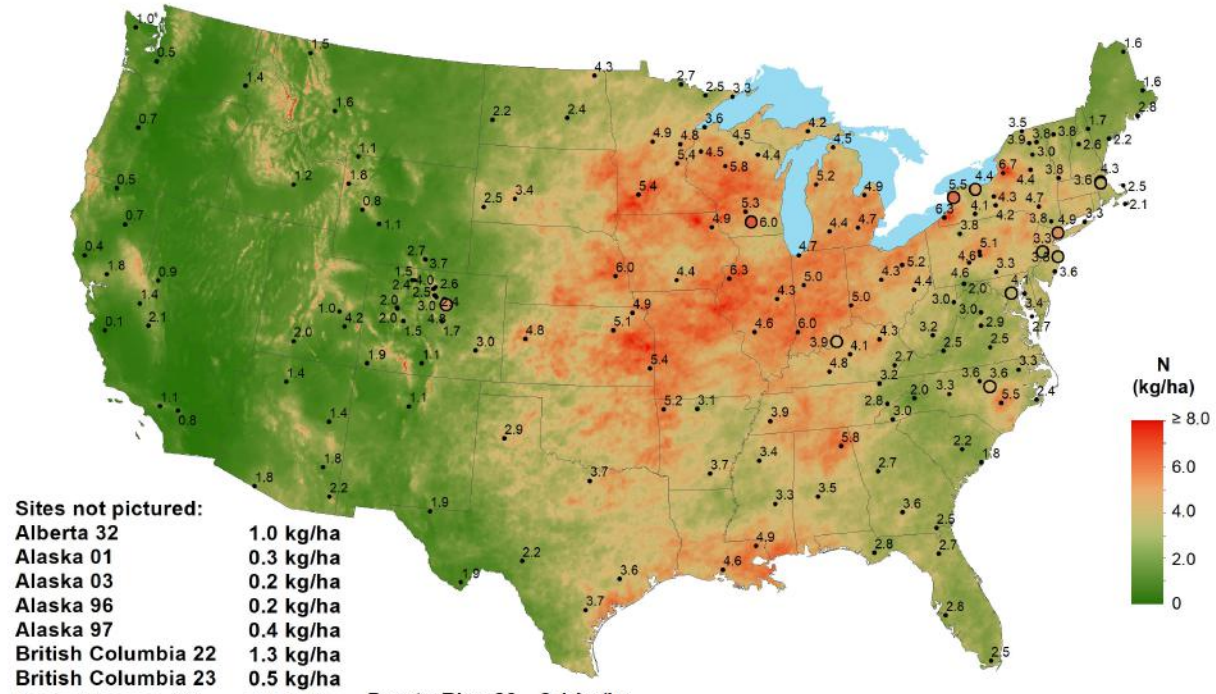
**NTN Maps**

The maps on pages 11 through 19 show precipitation-weighted mean concentration and annual wet deposition for select acid anions, nutrients, and base cations. Substantial spatial heterogeneity across the nation is apparent for all measured species. In 2021,



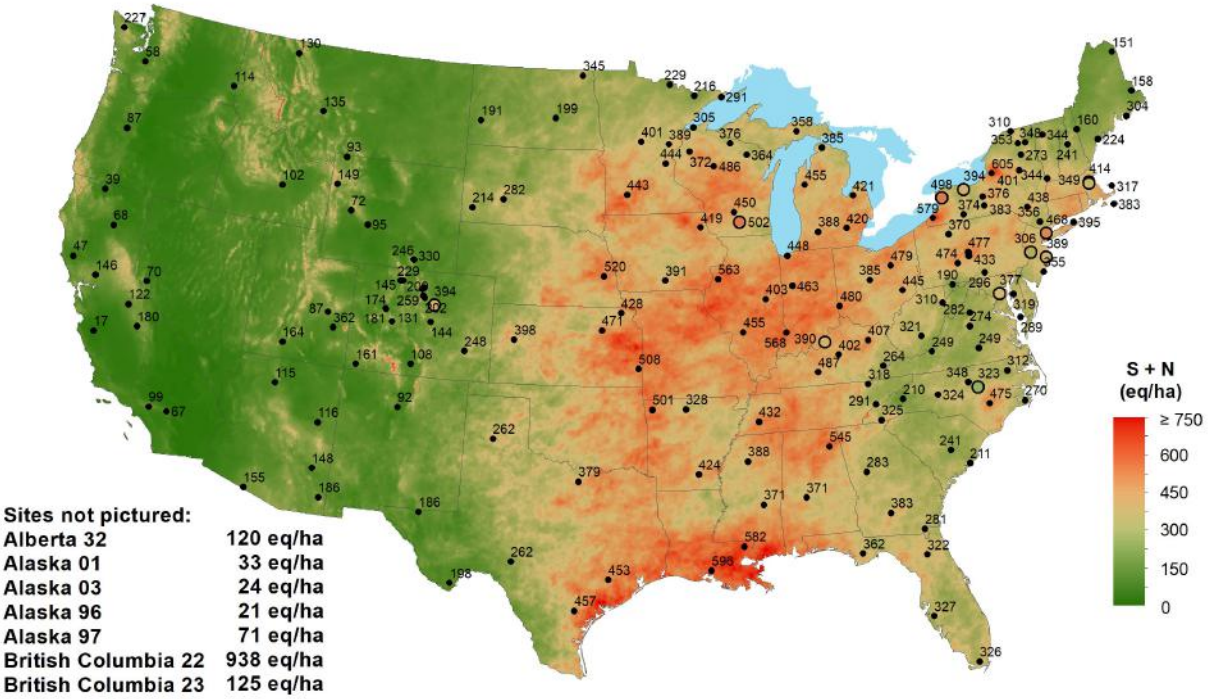

192 of the 268 active sites met NADP completeness criteria. Concentration and deposition maps are included for $SO_4^{2-}$, $NO_3^-$, $NH_4^+$, pH, $Ca^{2+}$, $Mg^{2+}$, $Cl^-$, and $Na^+$. Maps of $K^+$ are not included in this report, but are available from the NADP website.

Annual maps for wet deposition of inorganic nitrogen (i.e., $NO_3^- + NH_4^+$) and sulfur + nitrogen (S + N) are also included. S + N (i.e., $SO_4^{2-} + NO_3^- + NH_4^+$) deposition is mapped as hydrogen ion equivalents per hectare (eq/ha).




**Sites not pictured:**

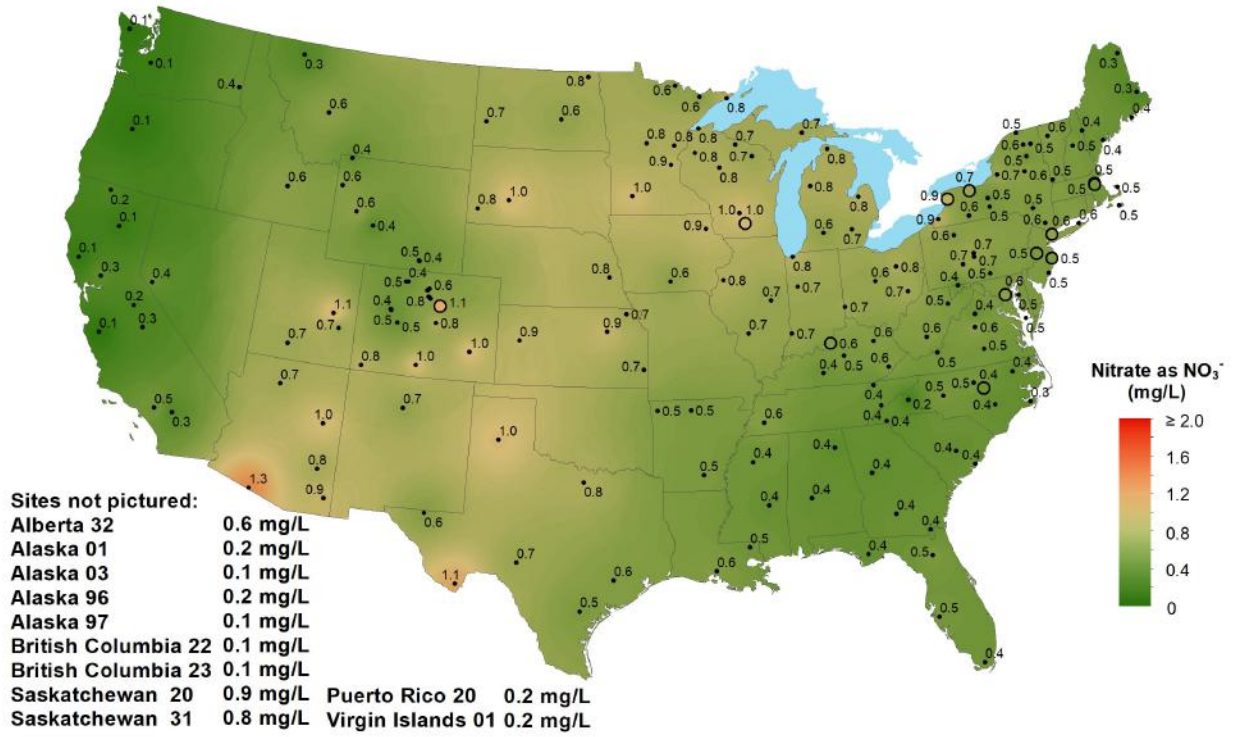
| | |
|---|---|
| Alberta 32 | 1.0 kg/ha |
| Alaska 01 | 0.3 kg/ha |
| Alaska 03 | 0.2 kg/ha |
| Alaska 96 | 0.2 kg/ha |
| Alaska 97 | 0.4 kg/ha |
| British Columbia 22 | 1.3 kg/ha |
| British Columbia 23 | 0.5 kg/ha |
| Saskatchewan 20 | 1.4 kg/ha |
| Saskatchewan 31 | 1.3 kg/ha |
| Puerto Rico 20 | 2.1 kg/ha |
| Virgin Islands 01 | 0.6 kg/ha |

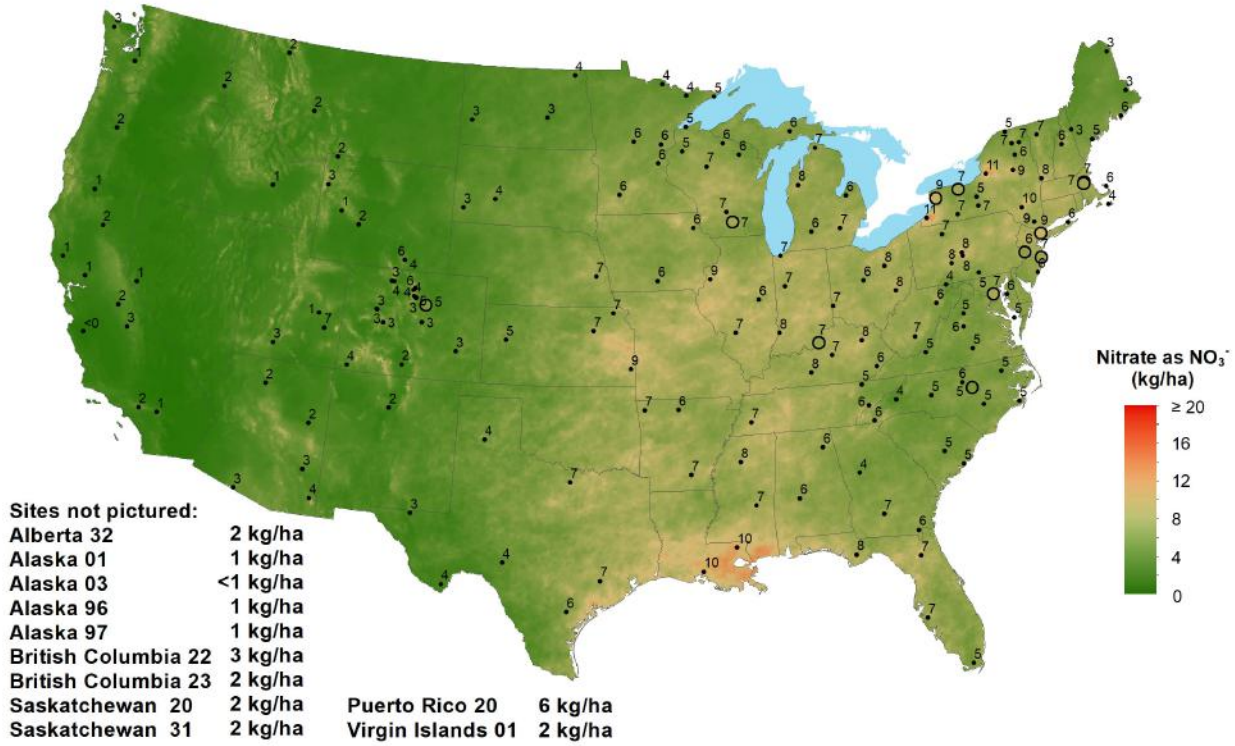



**Sites not pictured:**

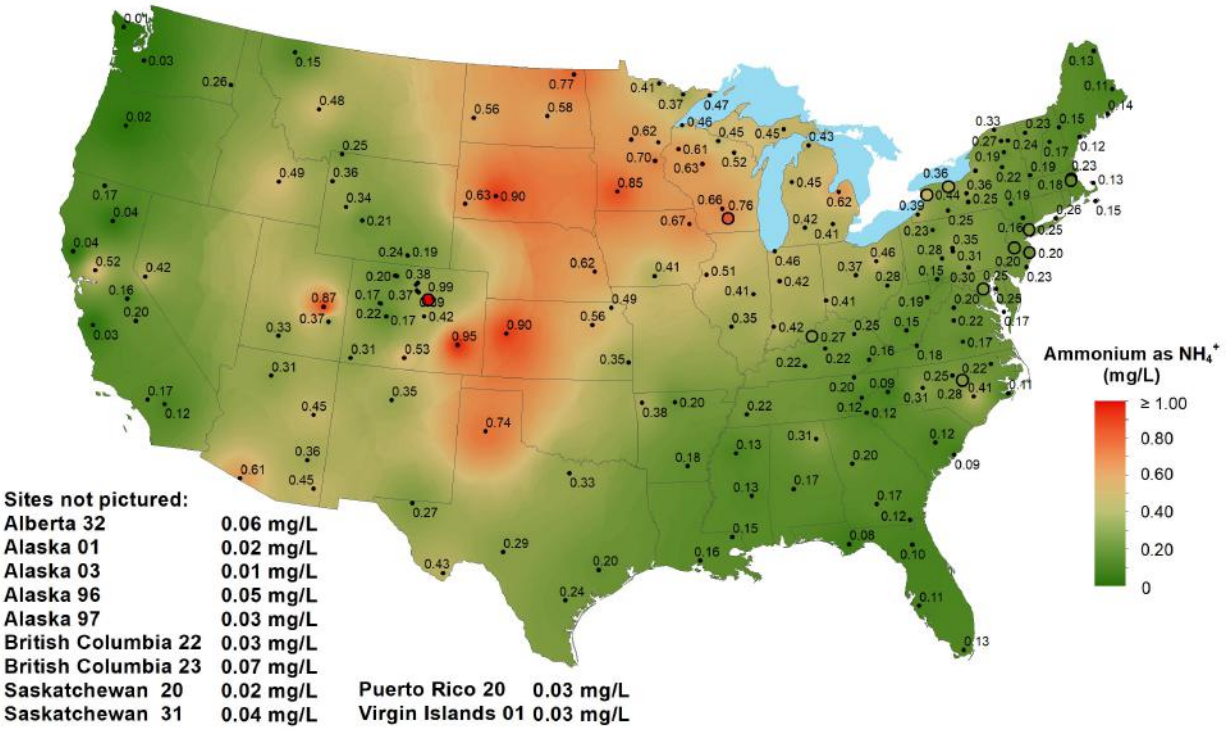
| | |
|---|---|
| Alberta 32 | 120 eq/ha |
| Alaska 01 | 33 eq/ha |
| Alaska 03 | 24 eq/ha |
| Alaska 96 | 21 eq/ha |
| Alaska 97 | 71 eq/ha |
| British Columbia 22 | 938 eq/ha |
| British Columbia 23 | 125 eq/ha |
| Saskatchewan 20 | 132 eq/ha |
| Saskatchewan 31 | 115 eq/ha |
| Puerto Rico 20 | 582 eq/ha |
| Virgin Islands 01 | 157 eq/ha |

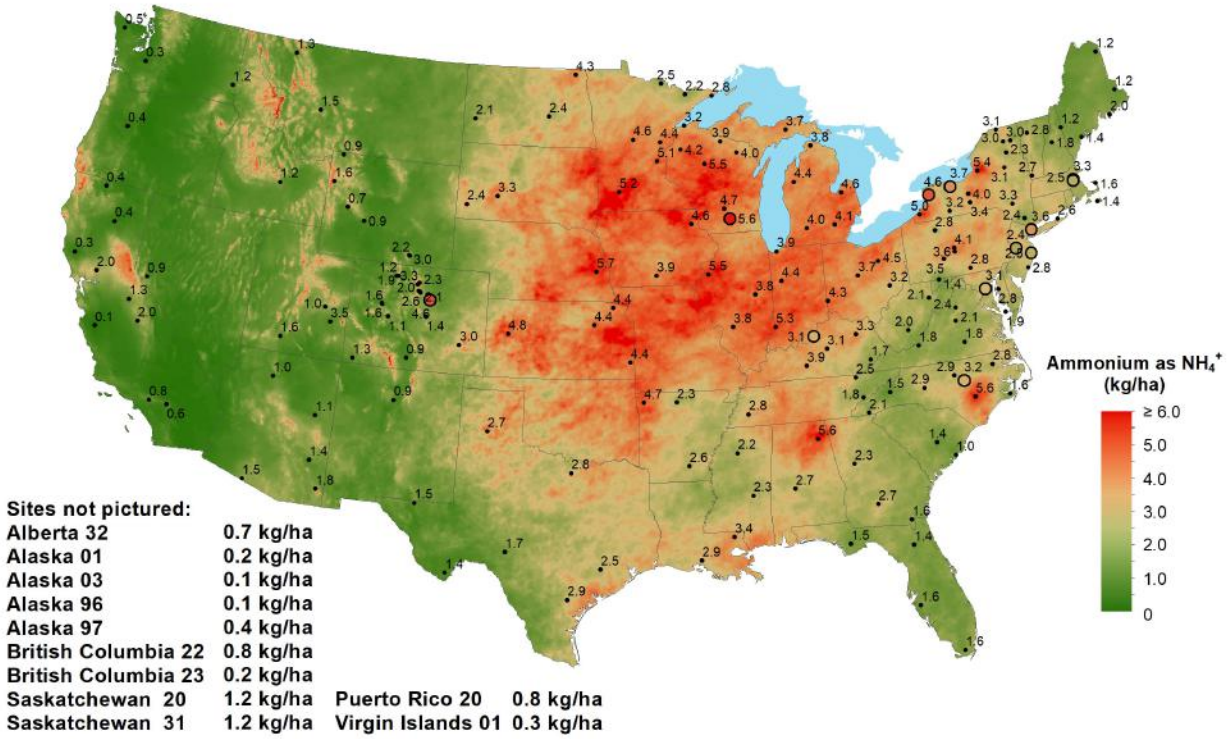
**Inorganic nitrogen wet deposition from nitrate and ammonium (top) and sulfur plus nitrogen wet deposition from sulfate, nitrate and ammonium (bottom), 2021.**



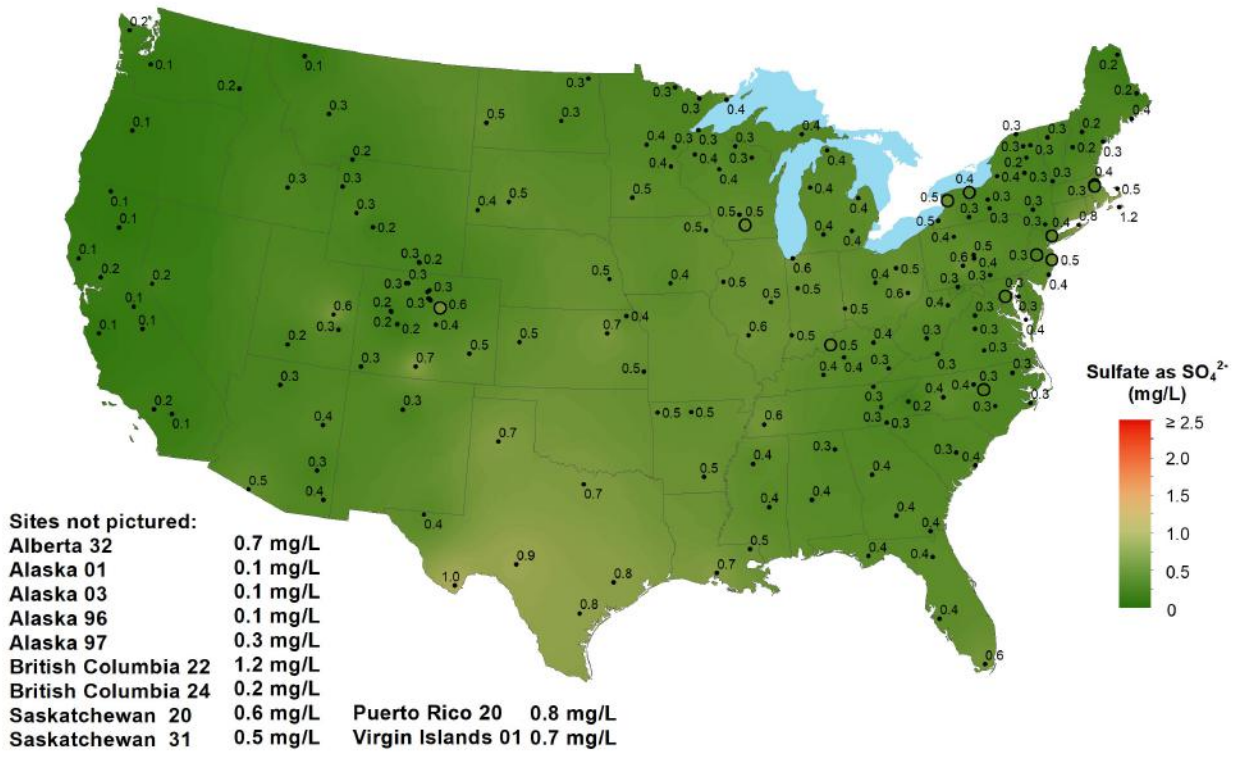



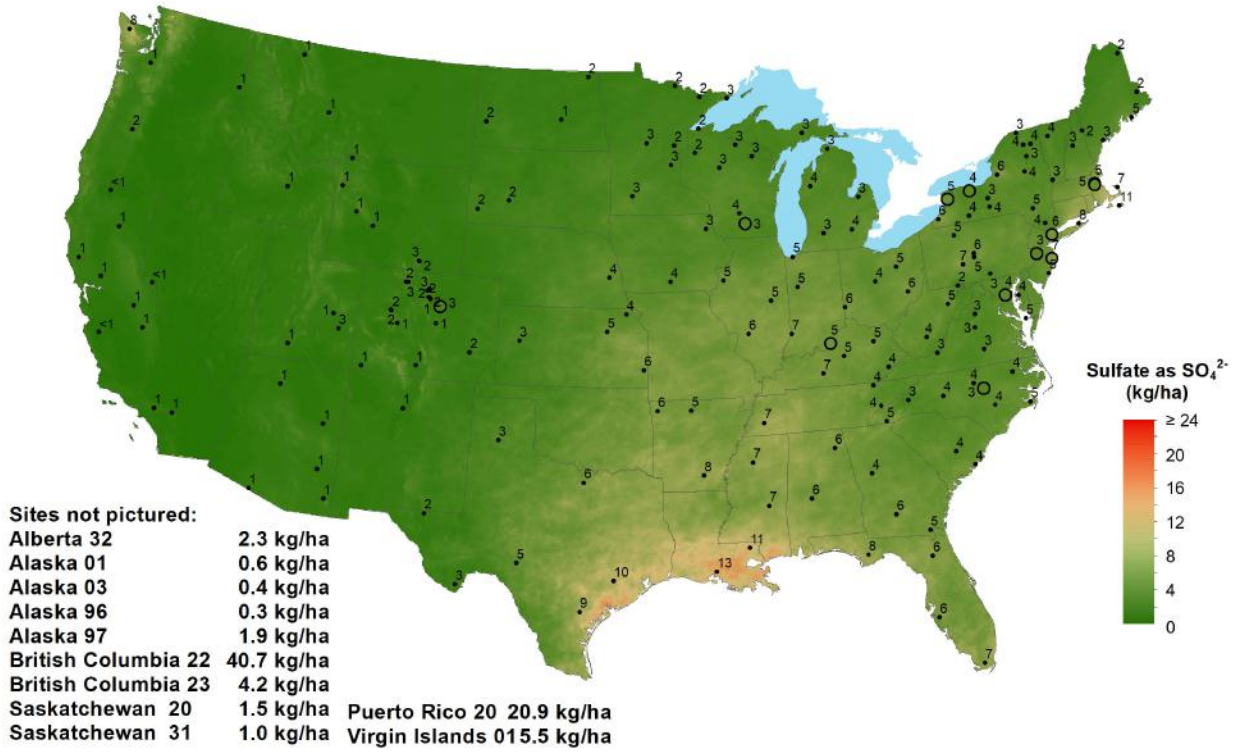

**Nitrate ion concentration (top) and wet deposition (bottom), 2021.**



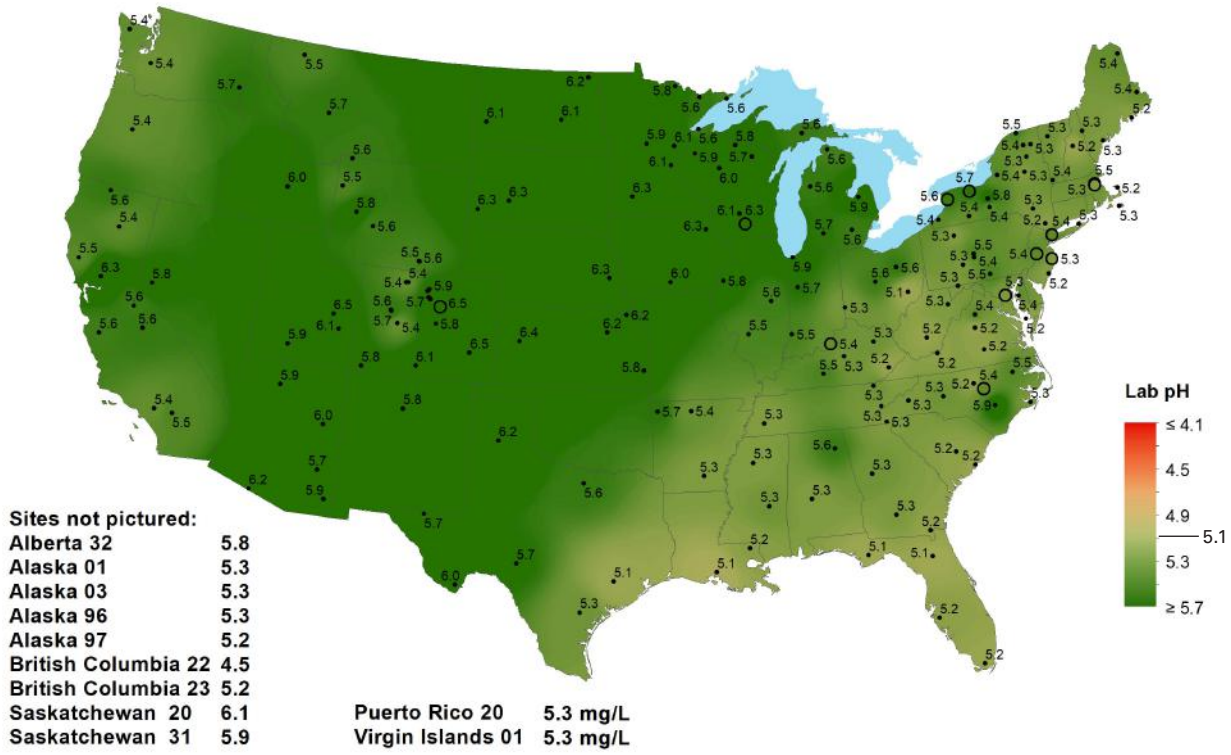




**Ammonium ion concentration (top) and wet deposition (bottom), 2021.**



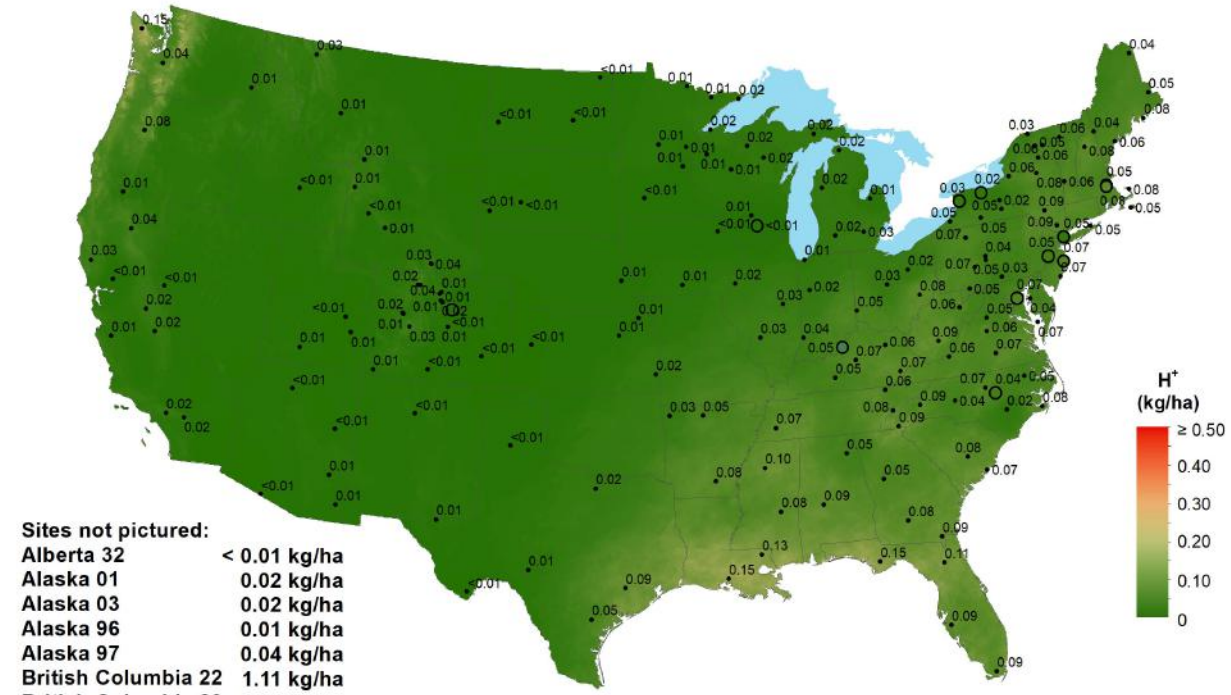




**Sulfate ion concentration (top) and wet deposition (bottom), 2021.**




| Sites not pictured: | |
|---|---|
| Alberta 32 | 5.8 |
| Alaska 01 | 5.3 |
| Alaska 03 | 5.3 |
| Alaska 96 | 5.3 |
| Alaska 97 | 5.2 |
| British Columbia 22 | 4.5 |
| British Columbia 23 | 5.2 |
| Saskatchewan 20 | 6.1 |
| Saskatchewan 31 | 5.9 |

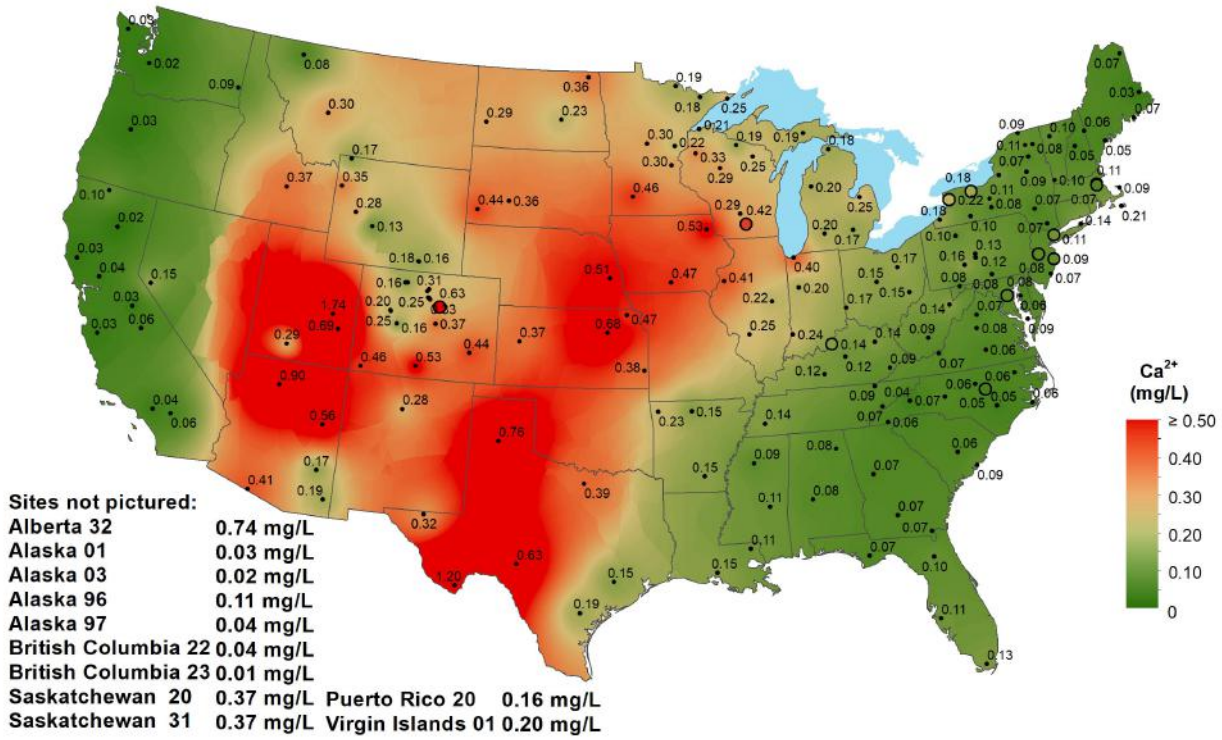
| | |
|---|---|
| Puerto Rico 20 | 5.3 mg/L |
| Virgin Islands 01 | 5.3 mg/L |

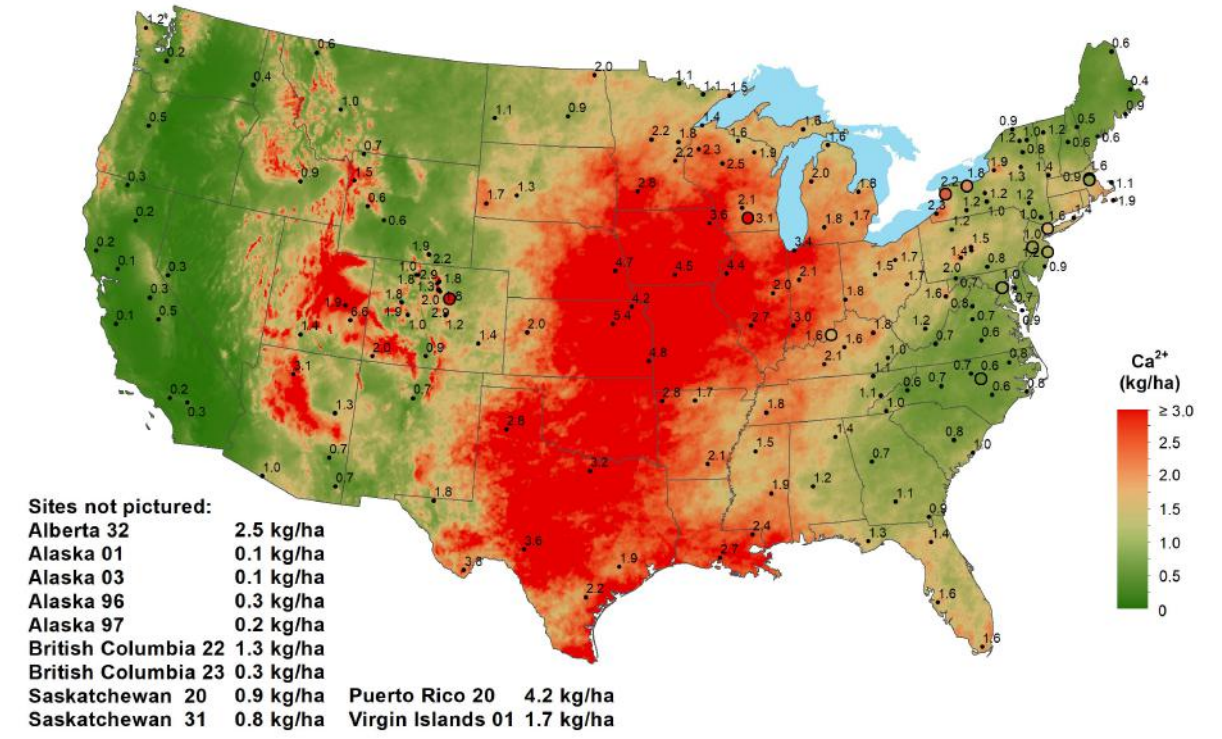



| Sites not pictured: | |
|---|---|
| Alberta 32 | < 0.01 kg/ha |
| Alaska 01 | 0.02 kg/ha |
| Alaska 03 | 0.02 kg/ha |
| Alaska 96 | 0.01 kg/ha |
| Alaska 97 | 0.04 kg/ha |
| British Columbia 22 | 1.11 kg/ha |
| British Columbia 23 | 0.13 kg/ha |
| Saskatchewan 20 | <0.01 kg/ha |
| Saskatchewan 31 | <0.01 kg/ha |

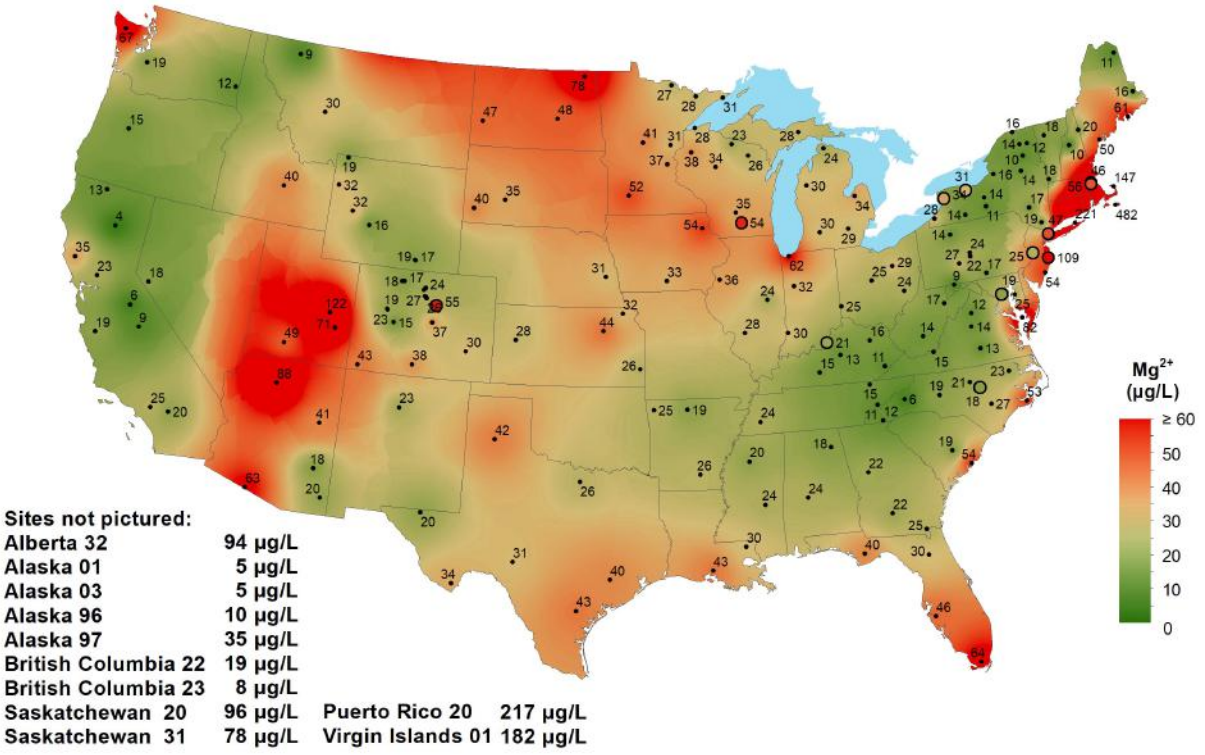
| | |
|---|---|
| Puerto Rico 20 | 0.14 kg/ha |
| Virgin Islands 01 | 0.04 kg/ha |

**Hydrogen ion concentration as pH (top) and wet deposition (bottom), 2021.**
**Typically, a precipitation pH of less than 5.1 is considered acidic precipitation.**

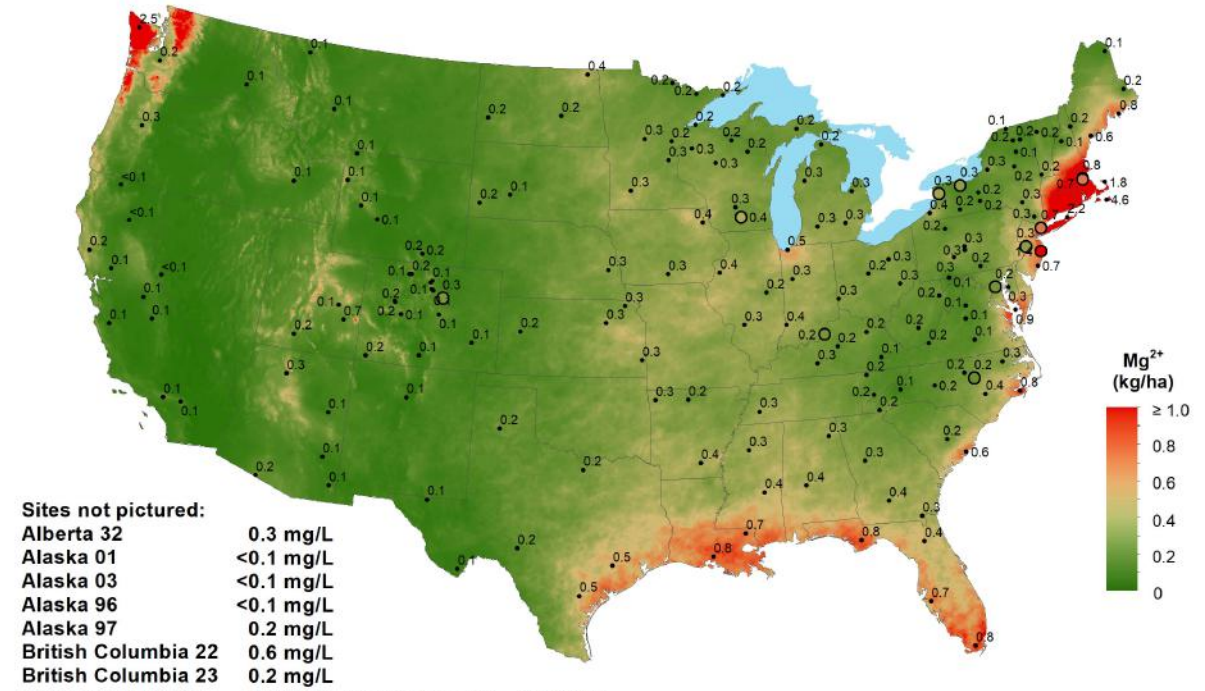



**Calcium ion concentration (top) and wet deposition (bottom), 2021.**

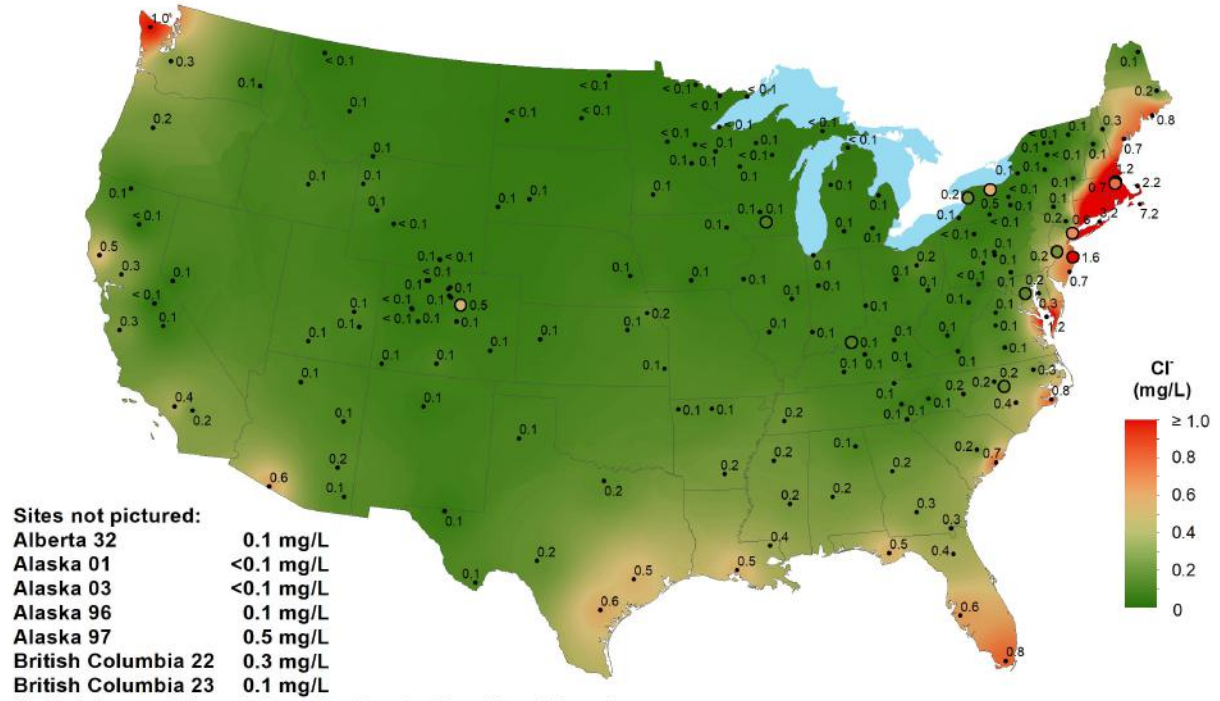



| Sites not pictured: | | | |
|---|---|---|---|
| Alberta 32 | 94 µg/L | | |
| Alaska 01 | 5 µg/L | | |
| Alaska 03 | 5 µg/L | | |
| Alaska 96 | 10 µg/L | | |
| Alaska 97 | 35 µg/L | | |
| British Columbia 22 | 19 µg/L | | |
| British Columbia 23 | 8 µg/L | | |
| Saskatchewan 20 | 96 µg/L | Puerto Rico 20 | 217 µg/L |
| Saskatchewan 31 | 78 µg/L | Virgin Islands 01 | 182 µg/L |

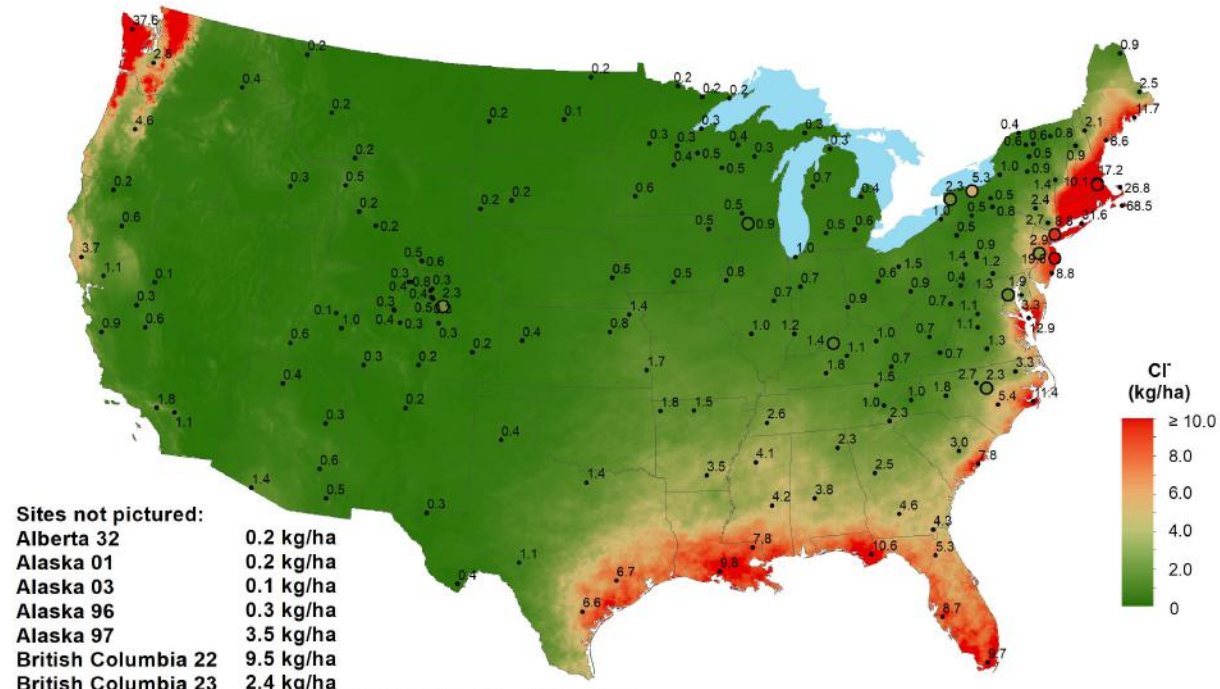



| Sites not pictured: | | | |
|---|---|---|---|
| Alberta 32 | 0.3 mg/L | | |
| Alaska 01 | <0.1 mg/L | | |
| Alaska 03 | <0.1 mg/L | | |
| Alaska 96 | <0.1 mg/L | | |
| Alaska 97 | 0.2 mg/L | | |
| British Columbia 22 | 0.6 mg/L | | |
| British Columbia 23 | 0.2 mg/L | | |
| Saskatchewan 20 | 0.2 mg/L | Puerto Rico 20 | 4.2 kg/ha |
| Saskatchewan 31 | 0.2 mg/L | Virgin Islands 01 | 1.7 kg/ha |

**Magnesium ion concentration (top) and wet deposition (bottom), 2021.**

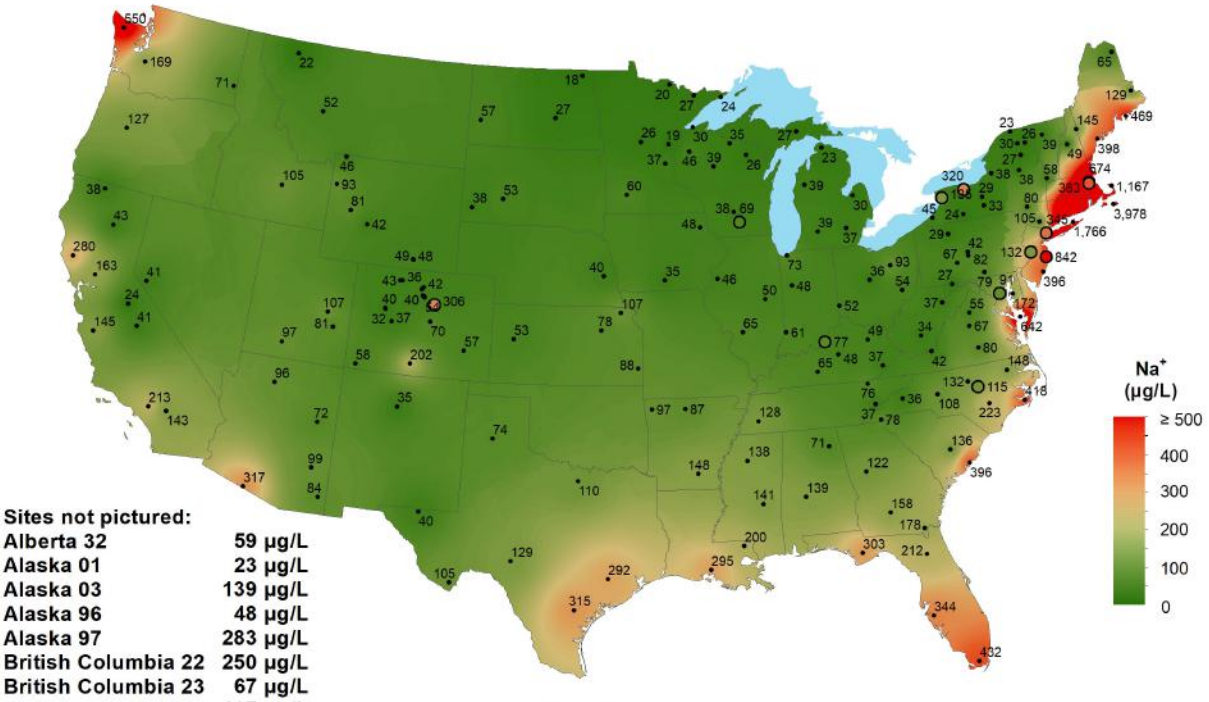



| Sites not pictured: | | | |
|---|---|---|---|
| Alberta 32 | 0.1 mg/L | | |
| Alaska 01 | <0.1 mg/L | | |
| Alaska 03 | <0.1 mg/L | | |
| Alaska 96 | 0.1 mg/L | | |
| Alaska 97 | 0.5 mg/L | | |
| British Columbia 22 | 0.3 mg/L | | |
| British Columbia 23 | 0.1 mg/L | | |
| Saskatchewan 20 | 0.1 mg/L | Puerto Rico 20 | 3.4 mg/L |
| Saskatchewan 31 | <0.1 mg/L | Virgin Islands 01 | 2.6 mg/L |



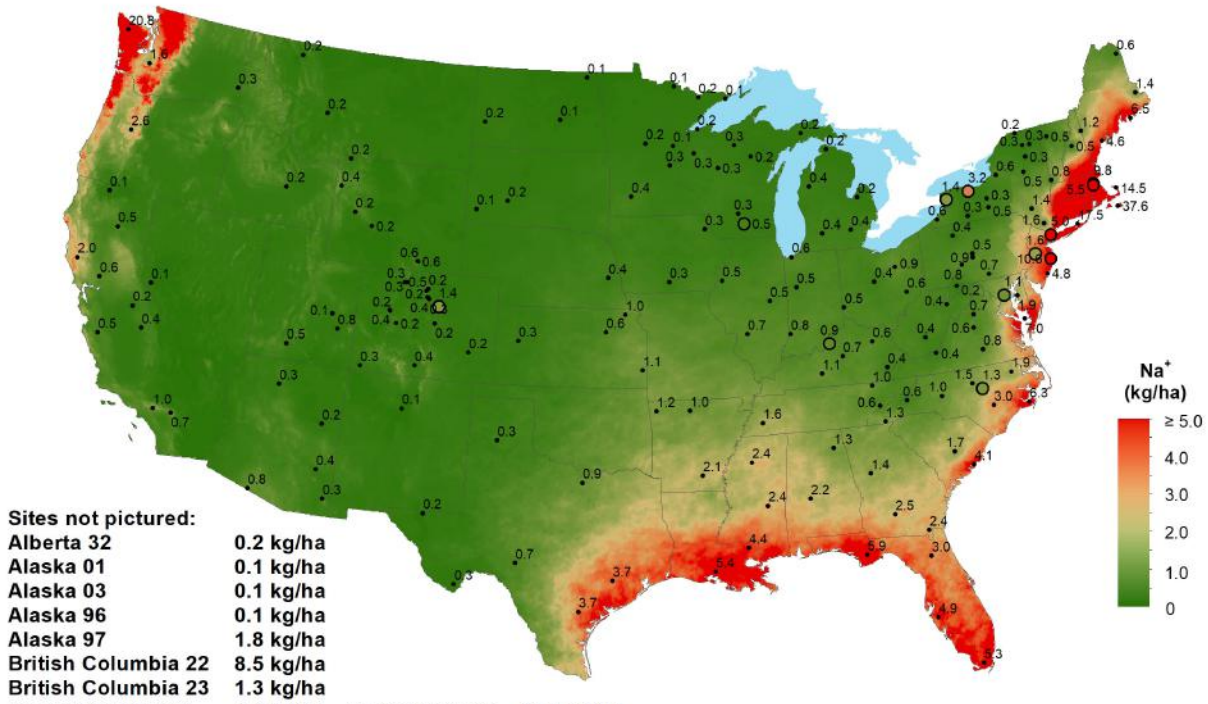

| Sites not pictured: | | | |
|---|---|---|---|
| Alberta 32 | 0.2 kg/ha | | |
| Alaska 01 | 0.2 kg/ha | | |
| Alaska 03 | 0.1 kg/ha | | |
| Alaska 96 | 0.3 kg/ha | | |
| Alaska 97 | 3.5 kg/ha | | |
| British Columbia 22 | 9.5 kg/ha | | |
| British Columbia 23 | 2.4 kg/ha | | |
| Saskatchewan 20 | 0.3 kg/ha | Puerto Rico 20 | 90.7 kg/ha |
| Saskatchewan 31 | 0.1 kg/ha | Virgin Islands 01 | 21.3 kg/ha |

**Chloride ion concentration (top) and wet deposition (bottom), 2021.**




**Sites not pictured:**

| | | | |
|---|---|---|---|
| Alberta 32 | 59 µg/L | | |
| Alaska 01 | 23 µg/L | | |
| Alaska 03 | 139 µg/L | | |
| Alaska 96 | 48 µg/L | | |
| Alaska 97 | 283 µg/L | | |
| British Columbia 22 | 250 µg/L | | |
| British Columbia 23 | 67 µg/L | | |
| Saskatchewan 20 | 167 µg/L | Puerto Rico 20 | 1732 µg/L |
| Saskatchewan 31 | 39 µg/L | Virgin Islands 01 | 1405 µg/L |




**Sites not pictured:**

| | | | |
|---|---|---|---|
| Alberta 32 | 0.2 kg/ha | | |
| Alaska 01 | 0.1 kg/ha | | |
| Alaska 03 | 0.1 kg/ha | | |
| Alaska 96 | 0.1 kg/ha | | |
| Alaska 97 | 1.8 kg/ha | | |
| British Columbia 22 | 8.5 kg/ha | | |
| British Columbia 23 | 1.3 kg/ha | | |
| Saskatchewan 20 | 0.4 kg/ha | Puerto Rico 20 | 46.3 kg/ha |
| Saskatchewan 31 | 0.1 kg/ha | Virgin Islands 01 | 11.7 kg/ha |

**Sodium ion concentration (top) and wet deposition (bottom), 2021.**

# Mercury Deposition Network (MDN)

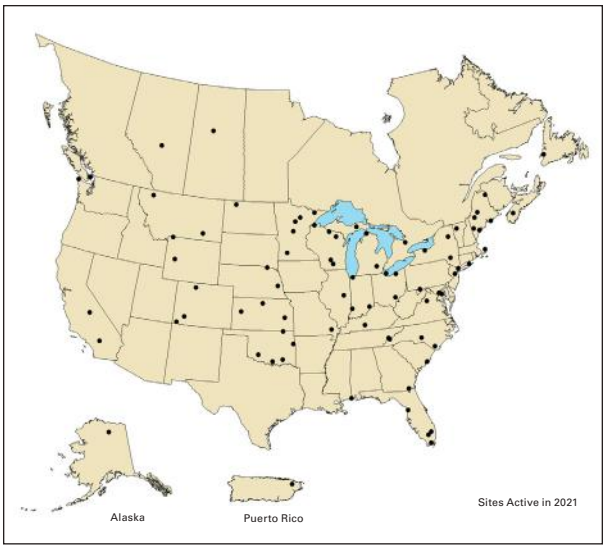
The MDN is the only network providing a long-term record for the concentration of mercury (Hg) in precipitation in North America. MDN sites follow standard procedures and use approved precipitation collectors and rain gages. The automated collector is similar to the NTN collector, but it is modified to preserve mercury. Site operators collect samples every Tuesday morning. Chemical analysis of the MDN samples is performed by the WSLH.

All MDN samples are analyzed for total mercury concentration. The HAL reviews field and laboratory data for accuracy and completeness, and identifies samples that were mishandled, compromised by equipment failure, or grossly contaminated.

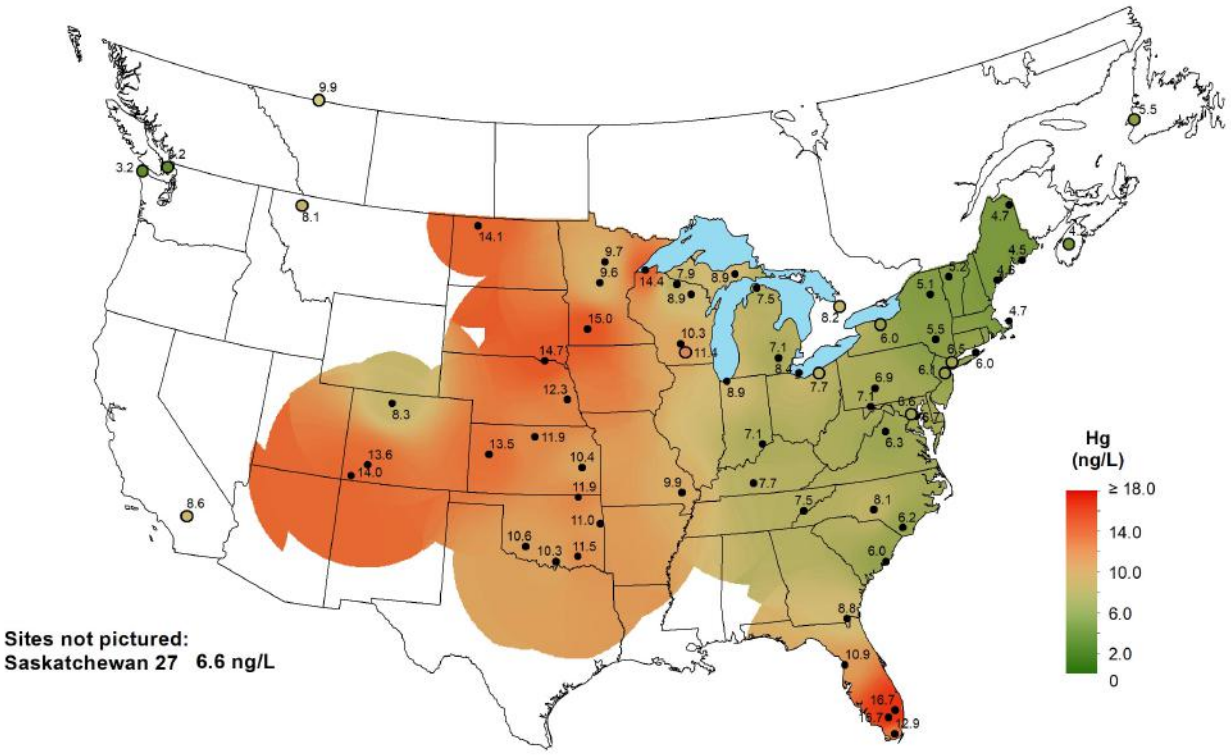
As of December 2021, there were 82 active MDN sites. Data from the MDN is available on the NADP website (http://nadp.slh.wisc.edu). Subsamples of MDN precipitation were analyzed for methyl mercury (MeHg) at 7 NADP sites. Details about sample collection and analysis are available on the NADP website.

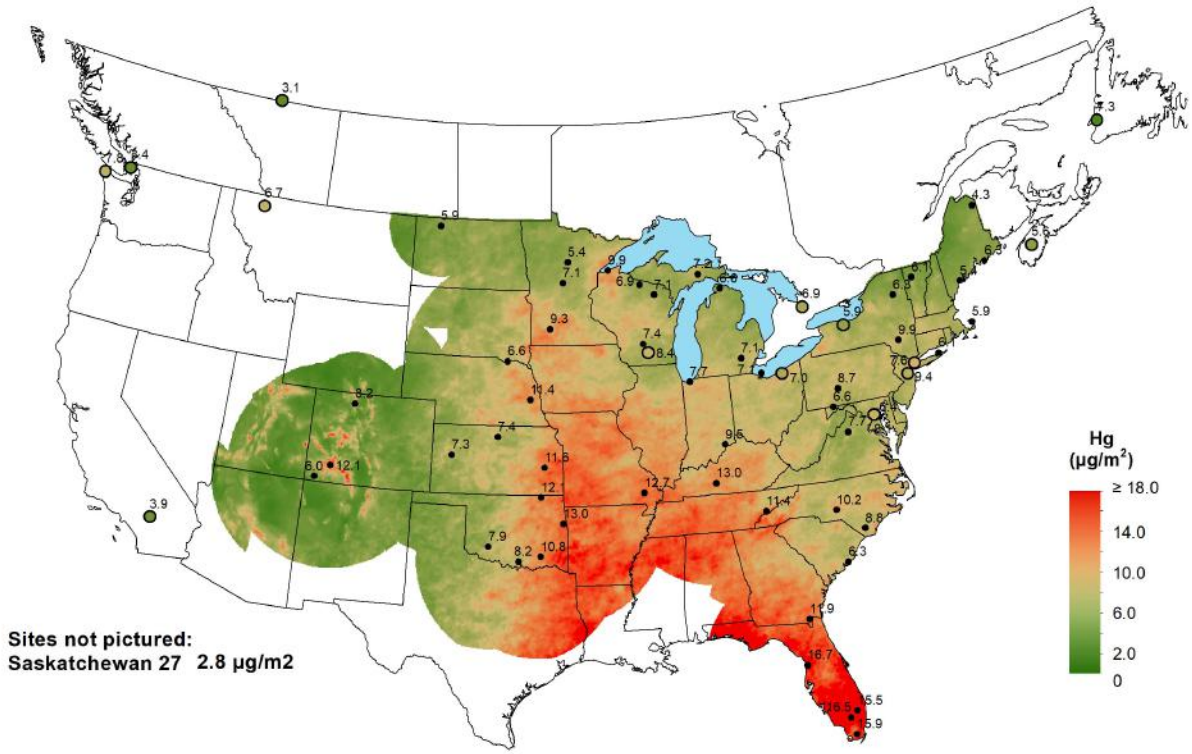
**MDN Maps and Graphs**

The maps on page 21 show spatial variability in the precipitation-weighted mean concentration and wet deposition of total mercury across the United States.




Only sites meeting NADP completeness criteria are included. In 2021, 65 of 82 active sites met these criteria. Large variations in both mercury concentrations and wet-deposition are observed across the nation.



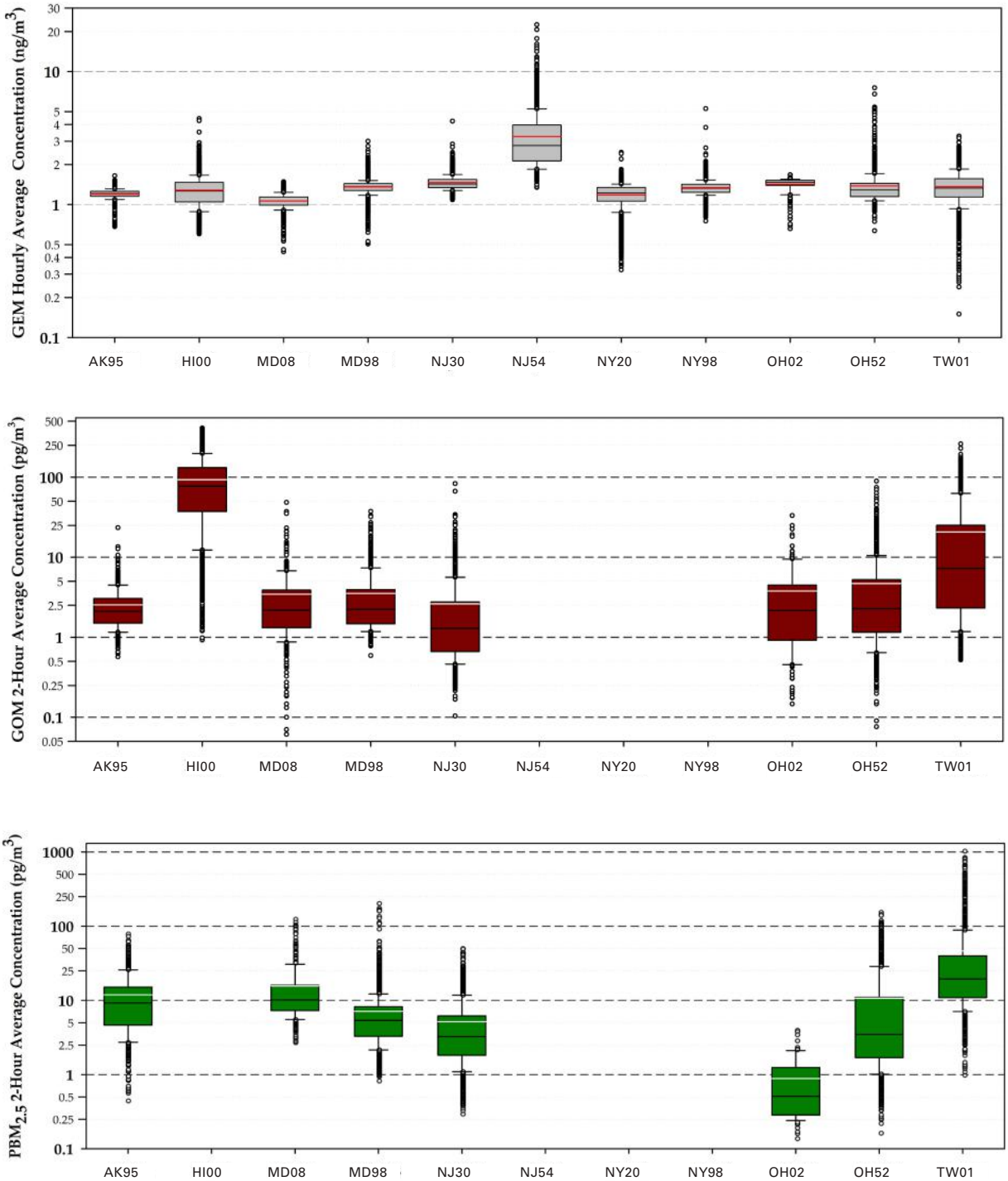

**Total mercury concentration (top) and wet deposition (bottom), 2021.**

# Atmospheric Mercury Network (AMNet)

AMNet sites measure ambient atmospheric mercury using automated, continuous measurement systems in order to understand the impact of atmospheric mercury on deposition. Quality-assured measurements are made using NADP standardized methods.

AMNet measurements are made continuously (five minute and two-hour averages). Data is qualified and averaged to one-hour (gaseous elemental mercury, GEM) and two-hour values (gaseous oxidized mercury, GOM, and particulate bound mercury, $PBM_{2.5}$). As of December 2021, there were 11 AMNet sites. Data from the AMNet are available on the NADP website (https://nadp.slh.wisc.edu).

The figures on page 23 show the distribution of atmospheric mercury concentrations for each site. The top figure shows the distribution of GEM (shaded grey area) for all sites reporting data. GEM is reported in nanograms per cubic meter ($ng/m^3$). The middle figure shows the distribution of two-hour atmospheric concentrations of GOM (red shaded area) and the bottom figure shows $PBM_{2.5}$ (green shaded area) in picograms per cubic meter ($pg/m^3$). Concentrations are plotted logarithmically, and with different scale ranges, to highlight the range of measured values for each site.




**Hourly GEM concentration in ng/m3 for each AMNet site (top) and 2-hour GOM and $PBM_{2.5}$ concentrations in pg/m3 for each speciating AMNet site (middle and bottom) in 2021. For each data set, the mean value is indicated as a red (GEM) or white bar (GOM and $PBM_{2.5}$) and the median is indicated as a black bar. Sites with no GOM and $PBM_{2.5}$ data shown did not monitor for speciated mercury.**

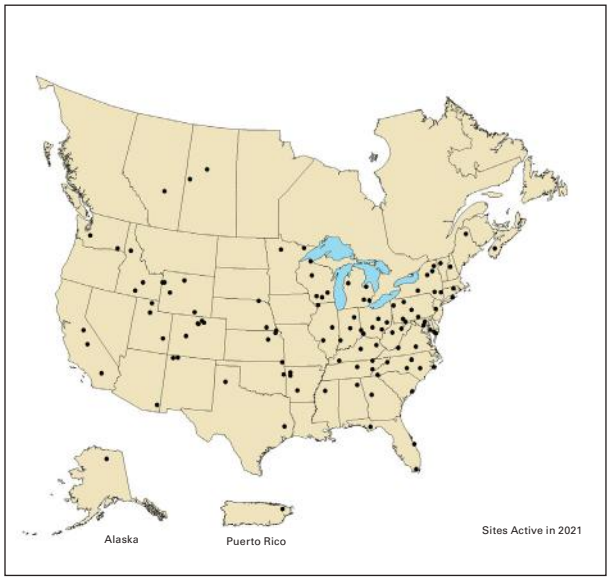
# Ammonia Monitoring Network (AMoN)

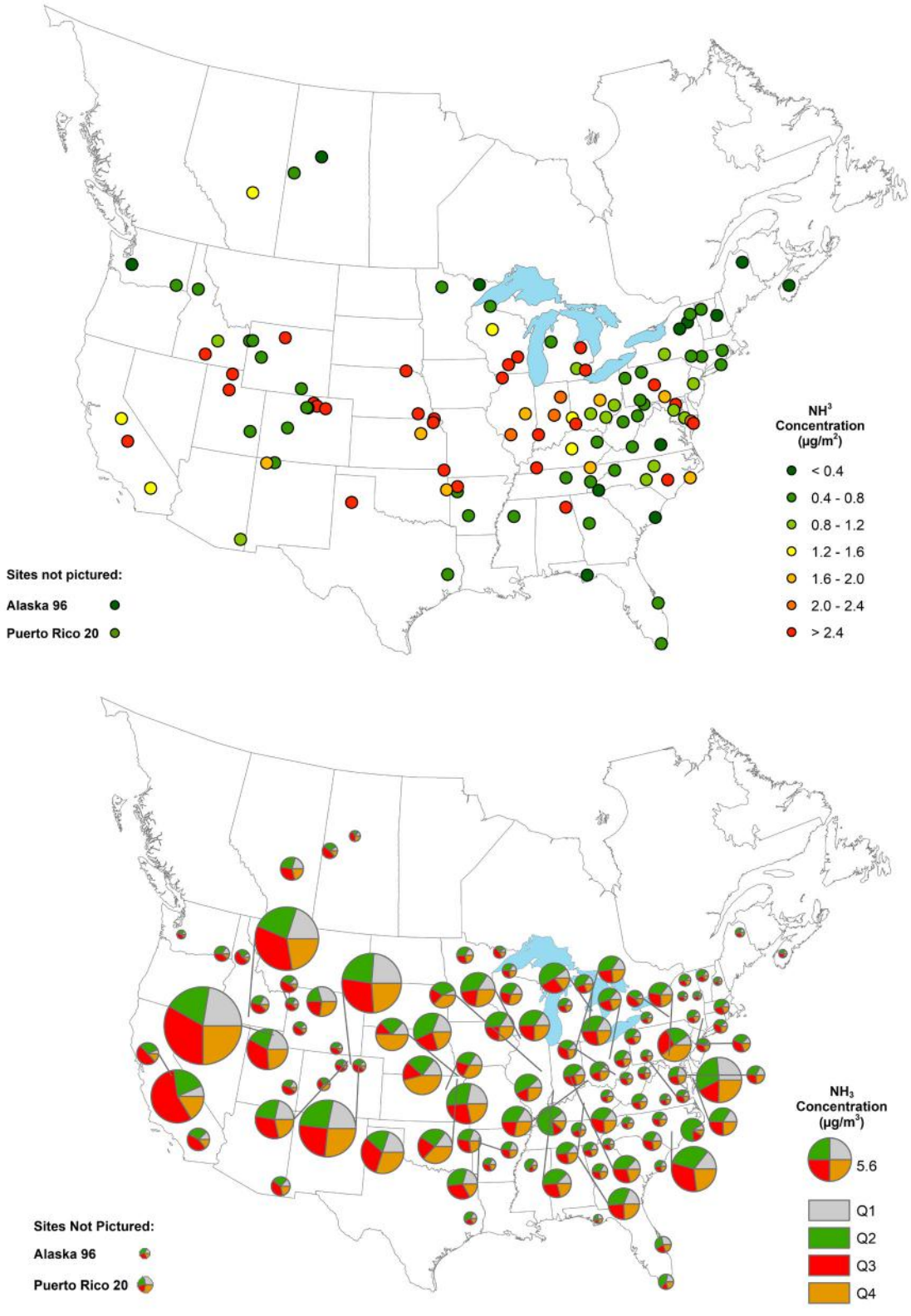
The AMoN measures atmospheric concentrations of ammonia ($NH_3$) gas. The network uses a passive diffusion-type sampler that provides cost-effective, accurate, and time-integrated measurements.

Sampling occurs over a two-week period, and all sites collect additional quality assurance samples on a rotating basis. This data is used to assess long-term $NH_3$ trends and changes in atmospheric chemistry, and to provide information for model development and verification.

As of December 2021, there were 112 AMoN sites. Data from the AMoN are available on the NADP website (https://nadp.slh.wisc.edu).

The figures on page 25 show the distribution and seasonality of gaseous ammonia concentrations for each site meeting completeness criteria. In the top figure, circles represent annual average concentrations in micrograms per cubic meter ($\mu g/m^3$) at each site. In the bottom figure, the relative concentration for each site is shown for each calendar quarter. The size of the wedge is the relative percentage for the quarter. The area of the pie chart is proportional to the annual average for the site.






**Average ammonia concentrations as measured by AMoN (top), and quarterly relative percentage (Q1 = January, February, March, etc.) for each AMoN site (bottom), 2021. Size of the symbol in the bottom plot is relative to the annual concentration.**

# Mercury Litterfall Network

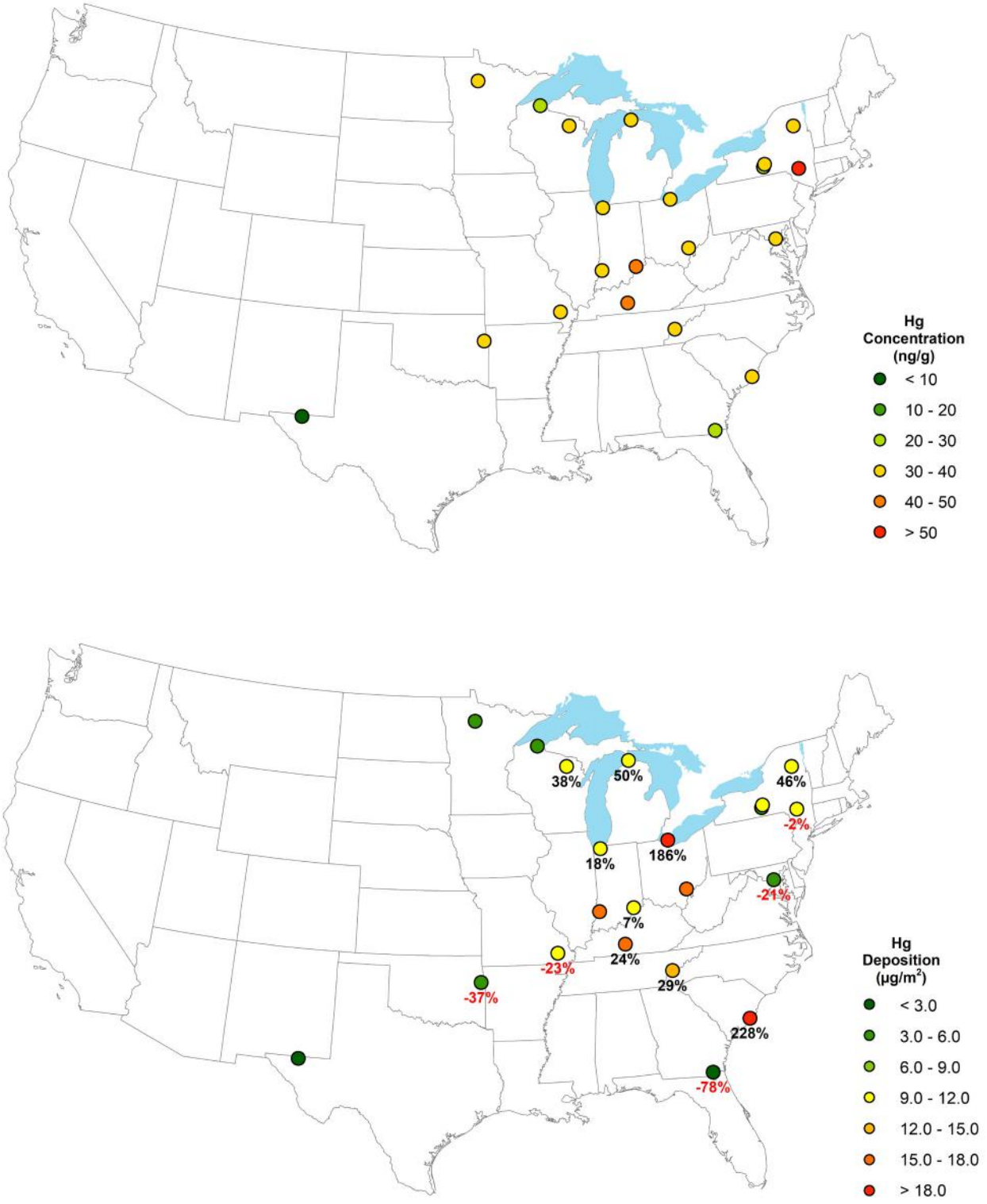
MLN sites measure concentrations of total mercury found in plant biomass litterfall associated with a forest overstory (leaves, twigs, debris, etc.) that fall to the forest floor. The network uses four passive collection samplers per site. The collectors are placed on the ground in randomized locations each year to estimate the deposition of biomass and associated total mercury.

Sampling occurs over a several month period (generally September to December) with monthly biomass collections retrieved from each collector. These monthly collections are dried, composited by collector, and ground. Total mercury is measured in each of the four composites, and a weighted mean seasonal mercury concentration (ng Hg/gram biomass) is calculated. Using the seasonal mercury concentration and seasonal biomass deposition (g/$m^2$/season), a flux of mercury (µg Hg/$m^2$/season) to the forest floor is calculated.

This data is used to assess deposition in this manner, for further study and comparisons to traditional wet and dry deposition of mercury in MDN and other measures. These measurements can be used for trends over time, and to provide information for model development and verification.

As of December 2021, there were 23 MLN sites. Data from the MLN are available on the NADP website (https://nadp.slh.wisc.edu).

The figures on page 27 show the total mercury concentration and deposition in biomass for the sampling season. The top figure shows the average concentration of total mercury per gram of biomass (ng Hg/g biomass) over the sampling season at each site. In the bottom figure, the total mercury deposition is shown as a function of the total biomass deposited at each site (µg Hg/$m^2$/season). The numerical value associated with each site is the amount above (black, positive) or below (red, negative) total mercury deposition as compared to the wet deposition of total mercury at the same site.




**Average total mercury concentration in biomass (top), and mercury flux with biomass per season (bottom), 2021. Numerical values in the lower figure are percentages of mercury biomass flux more than (black) and less than (red) the colocated MDN wet deposition flux.**

National Atmospheric Deposition Program

The NADP is the National Research Support Project-3: A Long-Term Monitoring Program in Support of Research on the Effects of Atmospheric Chemical Deposition. More than 250 sponsors support the NADP, including private companies and other non-governmental organizations, universities, local and state government agencies, State Agricultural Experiment Stations, national laboratories, Native American organizations, Canadian government agencies, the U.S. Geological Survey, the U.S. Environmental Protection Agency, the National Park Service, the National Oceanic and Atmospheric Administration, the U.S. Fish & Wildlife Service, the Bureau of Land Management, the U.S. Department of Agriculture - Forest Service, and the U.S. Department of Agriculture - National Institute of Food and Agriculture under agreement no. 2019-39132-30121. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the program sponsors or the University of Wisconsin-Madison.

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All NADP data and information, including color contour maps in this publication, are available free of charge from the NADP website: https://nadp.slh.wisc.edu. Alternatively, contact: NADP Program Office, Wisconsin State Laboratory of Hygiene, 465 Henry Mall, Madison, WI 53706, Tel: (608) 263-9162, E-mail: nadp@slh.wisc.edu.

The NADP Program Office is located at the Wisconsin State Laboratory of Hygiene (WSLH), at the University of Wisconsin–Madison.