The National Park Service

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The National Atmospheric Deposition Program and the National Park Service

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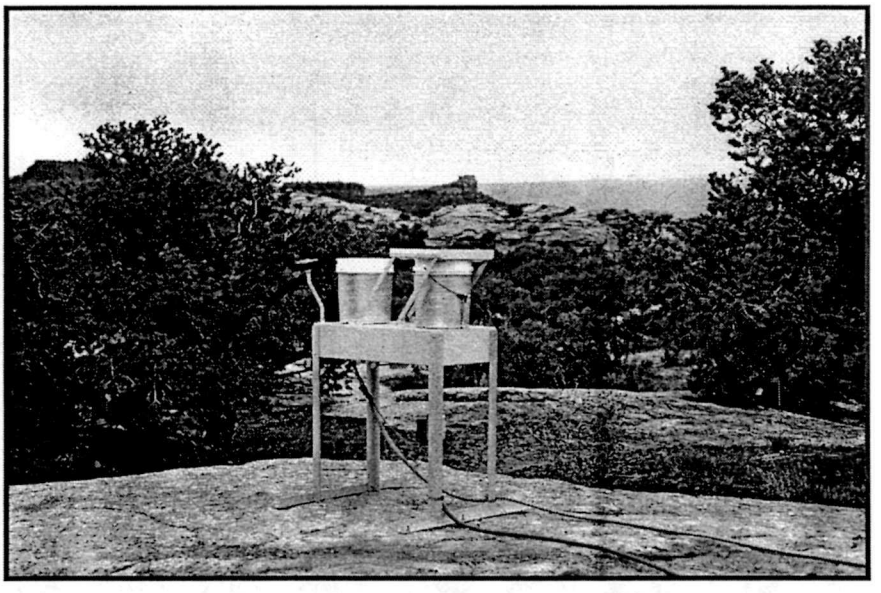
Background

One of the longest-running environmental monitoring networks in the United States, the National Atmospheric Deposition Program (NADP), was created in 1977 to measure acid precipitation and to study its effects. The network that is now referred to as the National Trends Network (NTN), has grown from 22 sites to more than 200 and operates in 46 states, extending from Maine in the East to Alaska in the West.

The purpose of the network is the collection of precipitation chemistry data to evaluate the geographic distribution and temporal long-term trends of air pollutants. NTN sites are located mostly in rural areas and consist of precipitation collectors and rain gauges. Precipitation on each site is collected weekly according to strict clean-handling procedures and sent to the Central Analytical Laboratory where samples are analyzed for hydrogen (acidity as pH), sulfate, nitrate, ammonium, chloride, and base cations (such as calcium, magnesium, potassium, and sodium). Excellent quality assurance programs ensure that the data remain accurate and precise.



Precipitation Collector in Canyonlands National Park

Sponsors of NTN include federal and state agencies, universities, public utilities, and industrial groups. Thirty-five NTN sites are located in National Park System units and provide data for education, research, resource management, and air regulatory programs. The NTN sponsors and the dedicated people who operate the sites have made NTN one of the most successful cooperative programs in the United States.

Use of the Data

Acid precipitation has the potential to cause ecological effects such as the acidification of surface waters, nutrient enrichment of estuaries, declines in forest health, and nutrient leaching

from soils. The 1990 amendments to the Clean Air Act (42 U.S.C. 7401-7671q as amended) are intended to reduce the adverse effects through reductions in annual emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) from utilities that burn fossil fuels. The reductions will reduce total SO_2 and NO_x emissions to below 1980 levels. NTN data are being used to evaluate the status and effectiveness of the reductions.

NTN data are also used to:

- examine the relation between pollutant sources, air quality, and precipitation quality
- assess the responses of lakes and forests to the changing chemistry of precipitation
- evaluate the importance of nitrogen deposition to coastal waters in which nutrient enrichment degrades water quality
- explore the causes and effects of decreasing base cation concentrations in precipitation.

NTN data are presented in tabular and graphical format on the world wide web and in publications. Additional information can be viewed on the NADP web site at http://nadp.sws.uiuc.edu.

Atmospheric Deposition in National Park System Units

The National Trends Network is the only network in the United States that can be used to determine spatial and temporal trends in the chemistry of precipitation. Concentrations of sulfate and nitrate in precipitation (in µeq/L) in 11 national parks are shown in the chart. These parks represent different ecosystems across the United States and include Acadia, Big Bend, Denali, Everglades, Glacier, Great Smoky Mountains, Olympic, Rocky Mountain, Shenandoah, Sequoia/Kings Canyon, and Theodore Roosevelt national parks. Averages of annual

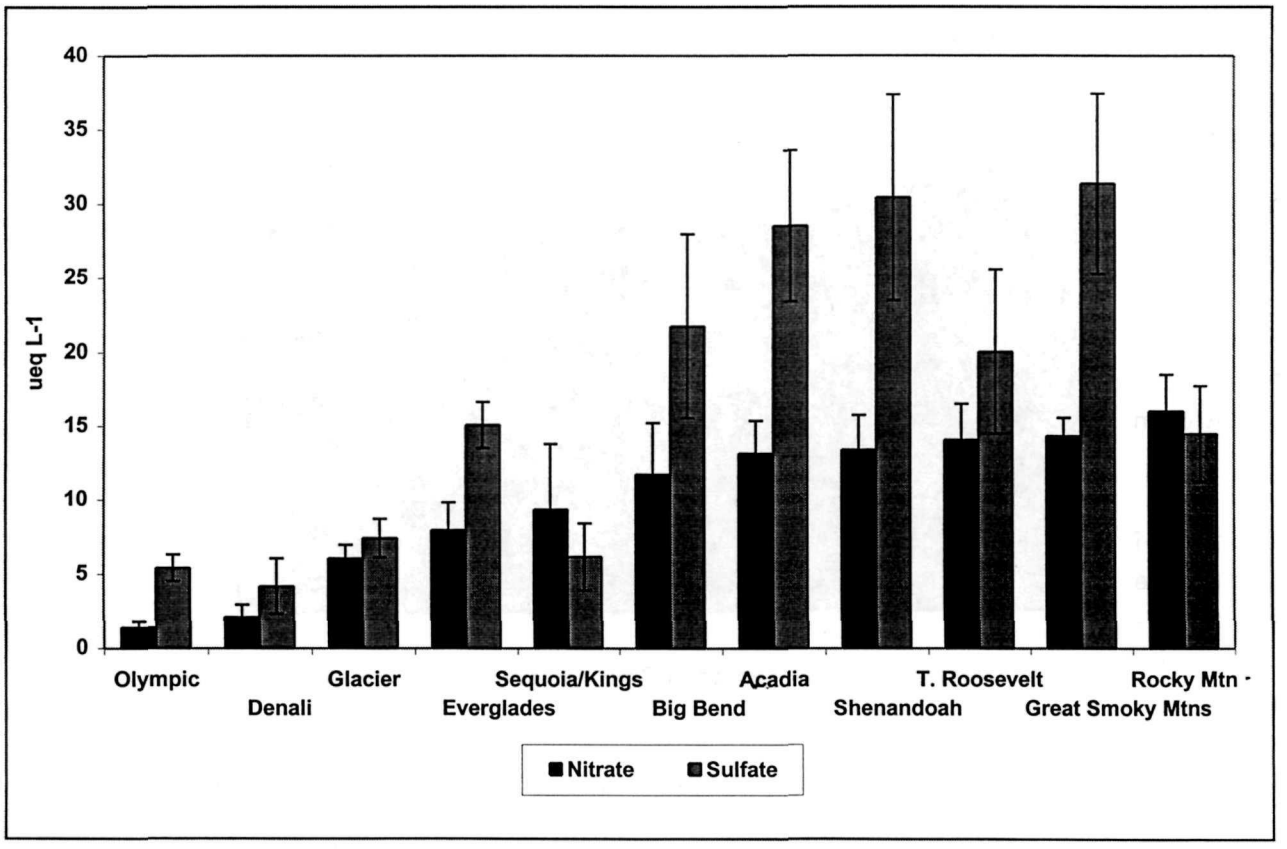


Figure. Volume-weighted mean concentrations of nitrate and sulfate in 11 National Park System units.

mean concentrations were calculated from data collected in 1984 to 1997.

The lowest volume-weighted mean concentrations of nitrate and sulfate were recorded in Olympic and Denali national parks (Figure). These sites are considered to have relatively clean air. Nitrate concentrations were highest (exceeding 15 µeq/L) in Rocky Mountain National Park, and sulfate concentrations were highest (exceeding 30µeq/L) in Acadia, Shenandoah and Great Smoky Mountains national parks.

In addition to the comparison of concentration data from sites that receive different amounts of annual precipitation, determination of the amount of solutes that are deposited to ecosystems is important. The NTN data summaries, in addition to concentrations, provide estimated depositions based on the amount of precipitation that fell at that point. Colored contour maps of annual nitrate and sulfate deposition on NTN sites across the country are available on the NADP web site. The spatial patterns in deposition reflect higher emissions in the eastern United States.

NTN data have also been used to evaluate temporal trends in precipitation chemistry. A summary of the data shows that nitrate concentrations in precipitation have stayed about the same in most sites. On the other hand, sulfate concentrations on the selected sites in the East have decreased by approximately 35% and reflect the recent reductions in SO_2 emissions.

Many national parks contain high elevation ecosystems where snow is the dominant form of precipitation. To complement NTN and to improve estimates of wet deposition in these ecosystems, snow chemistry is monitored by sampling columns of the snowpack at maximum accumulation. Because wet deposition is only a fraction of total deposition, dry deposition is also monitored in National Park System units as part of the Clean Air Status and Trends Network (CASTNet).

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