CAL CAL CAL CAL CAL

Central Analytical Laboratory

For more information about the Central Analytical Laboratory, write or phone:

Scott Dossett, CAL Site Liaison, 1-800-952-7353
Kenni James, CAL Quality Assurance, (217)333-9260
Mark Peden, CAL Laboratory Manager, (217)244-2522
Van Bowersox, CAL Director, (217)333-2213

Illinois State Water Survey
2204 Griffith Drive
Champaign, Illinois 61820-7495

NATIONAL ATMOSPHERIC DEPOSITION PROGRAM/
NATIONAL TRENDS NETWORK

Illinois State Water Survey
A Division of the Department of Energy and Natural Resources

Miscellaneous Publication 138

printed on recycled paper
using soybean ink

Thousands of precipitation samples are collected each year by the National Atmospheric Deposition Program/National Trends Network (NADP/NTN), the nation's acid rain monitoring network. A network of this size and importance requires careful, accurate laboratory analyses. Since the network's beginning in 1978, it has relied on its Central Analytical Laboratory (CAL) at the Illinois State Water Survey to fulfill its need for high-quality analyses and data.

CAL CAL CAL CAL CAL CAL

Monitoring the Problem

Air pollution is recognized as one of our nation's serious environmental concerns. Emissions of sulfur and nitrogen oxides from industry, electric power plants, and transportation enter the atmosphere, where they are transformed into sulfuric and nitric acids. These pollutants can travel hundreds or even thousands of miles before their capture and subsequent appearance as acid rain or snow. This is just one way that human activities change the chemistry of our atmosphere, i.e., our chemical climate. To monitor this change, the NADP, a cooperative research project of the State Agricultural Experiment Stations and other federal, state, and private research organizations, began operating a sampling network in 1978.

In 1980 the U.S. Congress passed the Acid Precipitation Act, which called for comprehensive research under the National Acid Precipitation Assessment Program (NAPAP). NAPAP plans included a network to detect and measure the intensity and trends of acidic precipitation. This new network, the National Trends Network (NTN), adopted most of the NADP sites then in existence and all of the NADP methods. By 1986 the combined NADP/NTN had grown to nearly 200 sites located across the United States, American Samoa, Puerto Rico, and Canada.

Today the NADP/NTN continues to provide data for research on the chemical climate and its effects on our environment. With the passage of the newly amended Clean Air Act in November 1990, N A P A P ' S future has been extended indefinitely.

CAL Beginnings

When it was formed, the NADP network required a single laboratory to analyze its samples. This laboratory had to meet strict analytical performance requirements and provide the network with a stable, responsive laboratory team. Chemistry labs at the Illinois State Water Survey had both experience in operating rain chemistry networks and a group of trained, fully qualified personnel who could accurately measure the low concentrations of chemicals found in rain samples.

As the search for a central lab began, the Water Survey labs entered the competition with other labs from around the nation. Each lab received synthetic rainwater samples for analysis and a visit by a site selection team that interviewed lab personnel. The NADP chose the Water Survey labs to be its Central Analytical Laboratory (CAL).

The Lab

Water Survey chemists perform the precipitation analysis at the CAL, and atmospheric scientists perform the data management. Teams from other agencies periodically evaluate both groups to ensure that their performance continues to meet all

program requirements. When NADP began, the lab received samples from about 20 network sites. An initial staff of six grew to meet the demands of an expanded network of up to 200 sites. Facilities and equipment also expanded and improved to keep pace with network growth and the latest technological advances.

In addition to precipitation analysis and data management, the CAL validates field-site measurements, provides sampling supplies to all sites, assists site personnel with operational problems, and conducts training courses for site operators.

Journey of a Precipitation Sample

Field technicians collect weekly precipitation sample buckets at the sites. After they record information about the collection and weather conditions, they carefully pack the sample buckets and send them to the CAL.

Each sample is checked in, weighed, inspected, measured for acidity, filtered, and placed in two clean bottles. As a quality assurance precaution, one bottle is refrigerated and stored for a minimum of five years. The sample in the second bottle, which is kept at room temperature, is ready for detailed chemical analysis. Individual chemicals are identified and their concentrations are determined by a variety of standardized methods, including ion chromatography, atomic absorption spectrophotometry, and automated wet chemistry.

All stages of sample collection, handling, and analysis follow carefully designed procedures and strict quality assurance controls. These controls include analyses of "blind" samples whose chemical makeup is unknown to the chemists but is known to quality assurance personnel who continually

check the precision and accuracy of all CAL analyses.

The journey through the analytical laboratory takes one to two weeks. The data are then sent to the data management group for categorizing, critical review, and coding. Information is added that will enable data users to select the data most appropriate for their use. These tasks take several months to complete and include manual and computerized checks, reanalysis of about six percent of all samples for quality assurance, and follow-up telephone calls and written communications with site personnel.

The Data and Their Use

The analytical results and background information on each sample are stored in computer files by the CAL data management group and transferred monthly to the NADP/NTN Coordination Office at Colorado State University.

The data are compiled by the Colorado