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Acid Precipitation in North America:

1986 Annual and Seasonal Data Summaries from Acid Deposition System Data Base

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ACID PRECIPITATION IN NORTH AMERICA:

1986 ANNUAL AND SEASONAL DATA SUMMARIES FROM ACID DEPOSITION SYSTEM DATA BASE

by

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ABSTRACT

This report summarizes the 1986 wet deposition precipitation chemistry data collected in North America and available in the Acid Deposition System (ADS) data base. Interpretative statistical analyses are not a focus of this report; however, users of the report will learn about major wet deposition monitoring networks in North America, the extent of their geographic coverage, and general characteristics of wet deposition for 1986. An overview of each network is given. Annual and seasonal statistical summaries for 1986 are provided for pH, hydrogen ion (derived from pH), and the ion species sulfate, nitrate, ammonium, calcium, chloride, sodium, magnesium and potassium.

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The data in this report are from the Acid Deposition System (ADS) for data storage and statistical reporting of atmospheric deposition data. Established by the U.S. Environmental Protection Agency at the Pacific Northwest Laboratory, it is funded as part of the National Acid Precipitation Assessment Program. ADS provides an integrated, centralized data base for data collected by atmospheric deposition monitoring networks in North America.

The ADS staff relies on dedicated individuals associated with each of the contributing networks for guidance in performing the functions associated with ADS. Without their help and patience our work would be much more difficult if not impossible. Special appreciation goes to Gwen Scott for NADP/NTN; Mary Ann Allan for UAPSP; Terry Dana for MAP3S/PCN; Diane Green for APIOS; and Bob Vet and Bill Sukloff for CAPMoN.

Our philosophy and efforts on procedures for preparing wet deposition summaries have been influenced by our participation on the Unified Deposition Data Base Committee. The committee, initiated by the Canadian Federal-Provincial Research and Monitoring Coordinating Committee's Atmospheric Subgroup, proposed precipitation data screening and wet deposition calculation procedures and recommended site representativeness, data completeness, and overall data quality ratings which have been utilized in the preparation of this report.

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SECTION 1

MONITORING NETWORK DESCRIPTIONS

The Acid Deposition System (ADS) is an integrated, centralized data repository for data storage and statistical reporting of atmospheric data collected by atmospheric deposition monitoring networks in North America. The purposes of ADS are (1) to facilitate access to deposition data collected by different organizations, (2) to provide annual statistical summaries of available data, and (3) to maintain the data for the assessment of long-term trends. A complete description of ADS is available in a system design and user's code manual by Watson and Olsen (1984).

This section gives a brief overview of the monitoring networks currently providing data to ADS. Networks with 1986 data appearing in the report are the National Atmospheric Deposition Program/National Trends Network (NADP/NTN), the MAP3S Precipitation Chemistry Network (MAP3S/PCN), the Canadian Air and Precipitation Monitoring Network (CAPMoN), the Acidic Precipitation in Ontario Study networks (APIOS-D, APIOS-C), and the Utility Acid Precipitation Study Program (UAPSP).

Wet deposition monitoring programs are conducted by a number of different organizations, each of which has its own specific objectives. Table 1.1 summarizes the monitoring networks contributing data to ADS. Other networks have initiated the process of participating in ADS and will be included in future reports. The descriptions that follow are not intended to be comprehensive but only to alert the user that the data summaries are from sites operated by different networks. Each network establishes its own network operating protocol to meet its research objectives. A bibliography of network documentation is given in Section 4.

Geographic locations of monitoring sites associated with each network are displayed in figures contained in Appendix A. The sites displayed are those sites that were operational during 1986. Two listings of all sites are presented in Appendices B and C. The first lists the sites by their arbitrary ADS identification number. The second orders the sites alphabetically by state and province. The latter also gives the site history as it is known to ADS. The sites listed in Appendices B and C represent a complete listing of all sites that are or were, at one time, operational for each network.

NADP/NTN

The National Atmospheric Deposition Program (NADP) was established in 1978 to monitor trends in precipitation chemistry in the United States. The NADP was created by the Association of State Agricultural Experiment Stations (originally as North Central Regional Project NC-141, now Interregional Project

IR-7) to conduct research on atmospheric deposition and its effects in cooperation with federal, state, and private research agencies. A major program objective is to discover and characterize spatial and temporal trends in the chemical climate of North America through the continued development and maintenance of a deposition monitoring network. Since its inception the network has grown from 22 operational sites during 1978 to 203 sites in 1986.

In 1982, the NADP assumed the responsibility for coordinating the operation of the National Trends Network (NTN) of the federally-supported National Acid Precipitation Assessment Program (NAPAP). The merged networks now have the designation NADP/NTN.

The NADP/NTN monitoring protocol is based on a weekly (Tuesday to Tuesday) sampling protocol with wet-only sample collection. The NADP/NTN program developed and adheres to strict requirements regarding sample collection and analysis. The requirements assure uniform site criteria, sampling protocol, analytical chemistry techniques, data handling, and overall network operation. All NADP/NTN precipitation chemistry samples are analyzed by the Central Analytical Laboratory at the Illinois State Water Survey. NADP/NTN measures the following: pH (field and lab), specific conductance (field and lab), sulfate, nitrate, ammonium, calcium, chloride, sodium, potassium, magnesium, and ortho-phosphate.

MAP3S/PCN

The MAP3S Precipitation Chemistry Network (MAP3S/PCN) began in 1976 with the objective of creating a long-term high-quality data base for the development of regional transport and deposition models (MAP3S 1982). This nine-station network, located in the northeastern United States, is designed to maximize information on regional precipitation chemistry, subject to the constraints of financial limitations on the number of stations and the geographical location of skilled operating groups. Precipitation samples are obtained on an event basis, "event" being defined as any 24-hour period during which precipitation occurred. Overall network coordination and central analytical laboratory operation are performed by the Pacific Northwest Laboratory of the Department of Energy. MAP3S measures the following: pH, specific conductance, sulfate, nitrate, ammonium, calcium, chloride, sodium, potassium, magnesium, ortho-phosphate, nitrite, sulfur-IV (sulfite), aluminum, and bromine.

UAPSP

The Utility Acid Precipitation Study Program (UAPSP) was established in 1981 to ensure that a precipitation chemistry data base of defined accuracy and precision would be available. The use of such a data base would include the evaluation of temporal and geographic variability and trends. Located in the eastern United States, the UAPSP network has grown from 9 sites to 25 locations which includes a 5-station set operated by the Electric Power Research Institute (EPRI) since 1979. In this report, all stations are referred to as the UAPSP network. During 1979 and 1980 two samplers were collocated at nine

sites. Since then, collocated samplers are maintained at two of the monitoring stations, with sites rotated yearly.

The UAPSP samples are collected on a daily basis. The quality of the sample measurements is controlled by providing standard operating procedures and staff training on all aspects of the measurement process from sample collection to data recording (Topol 1983a, 1983b, 1983c). Measurements and data acquisition are conducted by Combustion Engineering Environmental Monitoring and Services Center. UAPSP measures the following: pH (field and lab), specific conductance (field and lab), sulfate, nitrate, ammonium, calcium, chloride, sodium, potassium, magnesium, nitrite, sulfite aluminum, bromine, ortho-phosphate, strong acid, total acid, acidity, and total organic carbon.

CAPMoN

The Canadian Air and Precipitation Monitoring Network (CAPMoN) designed by the Atmospheric Environment Service is a regional-scale precipitation and air monitoring network. CAPMoN began operation in mid-1983 and replaces the Canadian Network for Sampling Precipitation (CANSAP) and the Air and Precipitation Network (APN) as Canada's national network for monitoring regional-scale air and precipitation quality.

The objectives of CAPMoN are (1) to measure regional-scale spatial and temporal variations and long-term trends in the chemical composition of air and precipitation, and wet and dry deposition in all regions of Canada (on time scales from days to decades). The chemical constituents of concern to the network are the major ions in precipitation and sulfur and nitrogen compounds in air, (2) to provide a database for use in the development and verification of long-range transport models, (3) to provide data for phenomenological studies, and (4) to provide a set of standard monitors in all regions of Canada in order to ensure the compatibility of air and precipitation measurements across the country. (These stations could serve to link provincial and other networks through co-location of local network stations at national sites.)

Precipitation monitoring began with three sites in Eastern Canada, and by the end of 1986, there were 24 sites in operation. Sampling is carried out on a daily basis, and the precipitation samples are analyzed at a dedicated precipitation laboratory. CAPMoN measures the following: pH (lab, ion balance-corrected and uncorrected), specific conductance (lab), sulfate, nitrate, ammonium, calcium, chloride, sodium, potassium, magnesium, ortho-phosphate, acidity, alkalinity, and calculates sea-salt corrected sulfate.

APIOS

In 1980, the Ontario Ministry of the Environment established two networks to monitor both wet and dry deposition of selected ion species. The networks (one cumulative, one daily) are under the auspices of the Acidic Precipitation in Ontario Study (APIOS). The purpose of the cumulative network (APIOS-C) is

to determine the long-term deposition pattern in Ontario (Chan, Orr, and Vet 1982a). It sampled on a monthly basis from its inception to the end of 1981 and then switched to a 28-day sample period on January 5, 1982. The sample period begins on a Tuesday to facilitate comparison with NADP stations. The daily network (APIOS-D), which has a daily sampling protocol, is designed to define the sector of origin of the ion species at the receptors, as well as the frequency and intensity of acidic deposition episodes (Chan, Orr and Vet 1982b).

The APIOS-C network began operation in July 1980 at 30 sites and expanded to 38 sites by 1986. The sites are selected to be regionally representative. APIOS-C measures the following: pH, gran Acidity, total Acidity, specific conductance, sulfate, nitrate, ammonium, calcium, chloride, sodium, potassium, magnesium, aluminum, total Kjeldahl nitrogen, total phosphorus, and trace metals zinc, iron, nickel, copper, lead, cadmium, manganese, and vanadium.

The APIOS-D network began operation in July 1980 at 8 sites and expanded to 17 sites by 1986. Four clusters of four samplers each form the basis for site location. Within each cluster the samplers are separated into two groups of two samplers each. Distances between groups are approximately 50 to 100 km and within groups, 5 to 10 km. At one site, collocated samplers are operated. APIOS-D measures the following: pH (lab), gran acidity, total acidity, specific conductance (lab), sulfate, nitrate, ammonium, calcium, chloride, sodium, potassium, and magnesium.

GLAD

Recognition of the important link between air pollution and the Great Lakes' water quality has slowly evolved over the past decade. Early studies on the eutrophication of the Great Lakes revealed that the atmosphere was a significant source of phosphorus that contaminated these lakes. This discovery gave birth to the Great Lakes Atmospheric Deposition (GLAD) network in 1976. During 1980, the U.S. Environmental Protection Agency's Great Lakes National Program Office assumed responsibility for this network and expanded and upgraded it to produce higher quality data. A secondary purpose of the U.S. Environmental Protection Agency's (US-EPA) GLAD network is to collect acid rain and acid snow data for the National Acid Rain Study. Precipitation samples are collected weekly, and sent to the Central Regional Laboratory (CRL) for routine physical/chemical analysis. Glad measures the following: pH (field and lab), specific conductance (field and lab), sulfate, nitrate, ammonium, calcium, chloride, sodium, potassium, magnesium, nitrite, total Kjeldahl nitrogen, total organic carbon, SiO_2, total phosphorus, alkalinity, acidity, suspended solids, and trace metals mercury, aluminum, barium, beryllium, cobalt, copper, iron, lithium, manganese, strontium, titanium, zinc, gold, cadmium, nickel, chromium, silver, and lead.

TVA

In 1971, the Tennessee Valley Authority (TVA) established a wet precipitation monitoring network. Samples are collected on a bi-weekly basis.

There are 32 stations presently operating. TVA measures the following: pH (lab), specific conductance (lab), sulfate, nitrate, ammonium, calcium, chloride, sodium, potassium, magnesium, ortho-phosphate, fluorine, weak acidity, and strong acidity.

EPA-SON

The EPA state operated network (EPA-SON) is comprised of sites operated by states and coordinated by EPA region offices. Currently, the network consists of 27 sites (in EPA Regions III, IV, VI, and VIII) located primarily in the eastern and southeastern United States. State agencies provide personnel to service the sites and submit samples to a central laboratory for analysis. The EPA regional offices and the Atmospheric Research and Exposure Assessment Laboratory (AREAL) coordinate the network and ensure that the data are carefully validated and meet the requirements for placement in the ADS data base. The EPA regional offices assist in site selection, operator training, data processing, coordination of the network, and fund the analysis of samples through a contracted central laboratory, Global Geochemistry, Corp. The AREAL provides external quality assurance assistance through a contract with Research Triangle Institute (RTI). The EPA-SON network collects weekly precipitation chemistry samples and measures the following: pH (field and lab), specific conductance (field and lab), sulfate, nitrate, ammonium, calcium, chloride, sodium, potassium, magnesium, strong acid, fluorine, nitrite, ortho-phosphate, and bromine.

TABLE 1.1. Wet deposition monitoring networks in the United States and Canada contributing data to the ADS

Network Abbreviation	Network Name	Start Date	Number of Sites in 1986	Sample Type
MAP3S/PCN	MAP3S Precipitation Chemistry Network	1976	9	Daily,[a] Wet
NADP/NTN	National Atmospheric Deposition Program/ National Trends Network	1978	203	Weekly, Wet
UAPSPb	Utility Acid Precipitation Study Program	1978	25	Daily,[a] Wet
CAPMoN[c]	Canadian Air and Precipitation Monitoring Network	1983	24	Daily, Wet
APIOS-C	Acidic Precipitation in Ontario Study - Cumulative Network	1980	38	Monthly,[d] Wet
APIOS-D	Acidic Precipitation in Ontario Study - Daily Network	1980	17	Daily, Wet
EPA-SON	EPA State Operated Network	1982	27	Daily, Wet
GLAD	Great Lakes Atmospheric Deposition	1980	41	Weekly, Wet
TVA	Tennessee Valley Authority	1971	32	Bi-weekly Wet

[a]Daily or duration of precipitation event, whichever is greater.

[b]UAPSP sites prior to 1981 were part of the EPRI/SURE network. The UAPSP network is scheduled to cease operation on December 31, 1987; on January 1, 1988 the same sites or ones near to the present UAPSP sites will begin operation as the Operational Evaluation Network.

[c]Some CANSAP and APN sites were transferred to CAPMoN during the period 1983 to 1986; before 1983, CANSAP and APN operated as separate networks.

[d]Sampling interval changed from calendar month to 28 days in January 1982.

REQUESTING ADS DATA

The ADS data bank offers to researchers without charge standardized data files on magnetic tape. These files consist of yearly, monthly, quarterly, or seasonal summaries similar to those contained in this report or raw sample data as it is presented from each network in the ADS format. These files may also contain additional data which have not been published due to the fact that some sites have not met the Unified Data Base Committee's summary criteria. Table 2.2 gives an overview of the data available.

TABLE 1.2. 1986 inventory of the ADS data base

Network Abbreviation	Sample Data Coverage	All Summaries	Raw Sample Data
NADP/NTN	1/78-12/87	YES	YES
CAPMoN	6/83-12/86	YES	YES
MAP3S/PCN	1/78-12/86	YES	YES
APIOS-C	7/80-12/86	YES	YES
APIOS-D	7/80-12/86	YES	YES
UAPSP	1/79-12/87	YES	YES
CANSAP	1/72-12/83	YES	YES
APN	1/78-1/83	YES	YES
WISC	3/82-6/84	YES	YES
TVA	5/78-12/86	YES	YES
EPA-SON		NO	YES

Additional copies of the following reports are also available:

Acid Deposition System (ADS) for Statistical Reporting: System Design and User's Code Manual

Acid Precipitation in North America: 1980, 1981 and 1982 Annual Data Summaries from Acid Deposition System Data Base

Acid Precipitation in North America: 1983 Annual Data Summary from Acid Deposition System Data Base

Acid Precipitation in North America: 1984 Annual Data Summary from Acid Deposition System Data Base.

Acid Precipitation in North America: 1985 Annual Data Summary from Acid Deposition System Data Base.

These publications and data tapes are available by making a request in writing to: ADS Coordinator, Computational Sciences Department, Mail Stop K1-85, Pacific Northwest Laboratory, P.O. Box 999, Richland, Washington 99352. Phone (509)375-2398.

SECTION 2

PREPARATION OF DATA SUMMARIES

North American wet deposition monitoring networks with 1986 data in ADS are NADP/NTN, CAPMoN, UAPSP, MAP3S/PCN, and APIOS. Annual and seasonal statistical summaries for 1986 are provided for pH, hydrogen ion (derived from pH), and the ion species sulfate, nitrate, ammonium, calcium, chloride, sodium, magnesium and potassium. This section describes the steps involved in the preparation of summaries using unified valid data screening, data completeness measures, and criteria for reporting a summary.

A major concern associated with any statistical summary is the quality of the data on which the summaries are based. The data summaries included in this report are prepared using a general algorithm and framework which explicitly addresses the concern for data quality. Data quality begins when networks establish operating protocols, perform data screening and implement quality control and quality assurance programs. ADS requires that networks provide documentation on their network operation and that a minimum set of information accompany each sample result. Hence networks not able to provide the required information are unable to transfer data to ADS. In preparing concentration and deposition summaries, four related steps occur. First, network protocols and data screening procedures are determined and an algorithm to translate this information along with the sample result to the ADS data base is constructed. Second, valid sample criteria for the data summary are determined. Third, data completeness measures for each summary are computed. Fourth, the data completeness measures and site representativeness are used to develop criteria for reporting a specific data summary. The following sections describe these four steps and the concept of site representativeness.

NETWORK PROTOCOLS AND DATA SCREENING

Precipitation chemistry monitoring networks collect precipitation samples in the field, transport them to an analytical laboratory for chemical analysis and report the sample results for others to use. Network specific protocol procedures are implemented to ensure that data are collected, analyzed and reported as consistently as possible. Each network uses a different approach to the screening and subsequent reporting of sampling data. For example, some networks have rigid screening procedures which a sample must pass before any data are reported. Other networks may use essentially the same screening procedures but will report the sample data accompanied by appropriate notes even when the sample does not meet the screening criteria. These differences in network screening and reporting of sample data must be considered when data from multiple networks are combined for an analysis.

The following is a general discussion of the data screening and reporting procedures applied in this report. Information is obtained from documentation available from each network and discussions with network personnel directly knowledgeable about their screening and reporting procedures. Most of the information is used in the transfer of each network's data to a common data format for wet deposition data used in the ADS data base.

Each network has a chemical analysis laboratory which performs sample analyses and checks the reasonableness of the sample analysis results using information available from the analysis. Some networks may use additional information to initiate a reanalysis. For the current purpose it is sufficient to state that each network receives data from a chemical analysis laboratory which has been subjected to internal laboratory checks. The results reported from the laboratory are assumed to represent the ion species concentration in the sample as received by the laboratory. All chemical analysis laboratories used by the networks participate in interlaboratory comparison studies. Laboratory sample analysis protocols are available from individual network coordinators.

Each network then combines the sample results from the laboratory with supporting comments and flags associated with the sample collection effort. This includes information from the time of field collection until the sample is analyzed. The information differs widely across the networks, especially as to how much is recorded in a network data base for others to use. The ADS data base incorporates all of the comments, codes and flags that are available from each network in a computerized form. It is assumed that the data sent to ADS by each network have been subjected to an internal screening process which is applied to individual samples. That process may result in samples being declared invalid/suspect and either not being reported or being appropriately coded.

VALID SAMPLE CRITERIA

Valid sample criteria have been designed to incorporate each network's comments, codes and flags into the decision process of determining whether an individual wet deposition sample result is to be included or excluded from a summary. The discussion on screening for valid samples is stated in terms of the ADS data base common record format (Watson and Olsen, 1984) with some reference to network specific codes as necessary for clarification.

All networks include note codes which are informational in nature. Some codes denote reasons why sample results are not available or reported. Other codes describe conditions present in the field, and during sample transit and sample receipt. Unless explicitly stated elsewhere, these note codes are not used in determining whether a sample is valid. The basic premise is that each network has screened individual sample results for possible contamination. If a sample result passes the network's screening, it is assumed that possible sample contamination indicated by field or lab comments did not materially affect the sample ion species concentrations.

A set of valid sample criteria has been designed for each network. Each sample associated with a sampling period is screened to determine whether the sample meets specific criteria. The screening criteria use the informational comments and codes provided by each network. The criteria are:

- All sampling periods for which it is known that no precipitation occurred are considered valid sample periods. This applies mainly to weekly, monthly and 28-day sampling protocols. For event and daily sampling protocols the absence of a sample record for a day implies that no precipitation occurred.

- The wet deposition sample must be a wet-only sample. All samples identified as bulk, partially bulk or undefined are invalid.

- Wet deposition samples that have insufficient precipitation to complete a chemical analysis for a specific ion species are invalid for that specific ion species. Event/daily samples are most likely to have this occur.

- An individual ion species concentration accompanied by a comment code designating the measurement to be "suspect"or "invalid" is declared an invalid sample. Deletion of the ion species concentration by the network for the same reason has the same result.

- The actual sampling period for a wet deposition sample must be close to the network's protocol sampling period. Specifically, the following conditions lead to an invalid sample:

  For NADP/NTN, actual sample period less than 6 days or greater than 8 days. This includes all NADP/NTN samples coded "LD" with measured precipitation.

  For APIOS-C, actual sample period less than 21 days or greater than 35 days.

SITE REPRESENTATIVENESS

The "quality" of a summary is a function of the representativeness of the chemistry of the precipitation. This includes consideration of whether the sampling site is, in some sense, representative of the local regional area and whether the chemistry reported for a sample is representative of the precipitation that actually occurred at the site. The latter is not explicitly addressed in this report but is addressed by each network's siting protocols. The former, site representativeness, is addressed below.

A definition of site representativeness implies that specific criteria for measuring representativeness are available. The criteria would reflect those attributes that are important for a specific objective, e.g., evaluation of

spatial patterns in wet deposition over North America. No generally accepted quantitative or qualitative rating of site representativeness for all precipitation chemistry sites included in the ADS data base is available. The concept of site representativeness has been addressed by the Unified Deposition Data Base Committee. They developed a process for assigning site representativeness ratings centered around the concept of "regionally representative" in the context of evaluation of long-range transport models. Although their assignments reflect only one concept of site representativeness, they are included in this report because the concept is important and the assignments are the only ones currently available. Site representativeness ratings defined by the Unified Deposition Data Base Committee are given in Table 2.1.

TABLE 2.1. UDDC site representativeness rating descriptions

Rating	Description
1	Regionally representative
2A	Potentially regionally representative
2	Regional representativeness uncertain
2B	Potentially regionally unrepresentative
3	Regionally unrepresentative
blank	Representativeness not determined

The assignment of a rating to a site involves evaluation of seven criteria. If a site fails one or more of the criteria, it is generally considered to be unrepresentative (rating 3) for monitoring regional-scale wet deposition. Exceptions occur if previous examination of historical data from the site or if the judgment of researchers familiar with the site, indicate that the local interferences are small or insignificant. The seven criteria applied are:

- No continuous industrial source, a town or suburban area located within 10 kilometers.
- No major point source (or combination of point sources) with emissions greater than 10,000 tons sulfur dioxide or nitric oxide per year, located within 50 kilometers.
- No surface pollutant storage facility (e.g., salt pile) located within 100 meters.
- No transportation sources, furnaces or incinerators located within 100 meters.
- No cultivation or other agricultural activity occurs within 500 meters.

- No buildings, trees, etc., impinge on the cone defined by a 45 degree angle above the horizonal plane and centered at the site (30 degrees is considered optimal but 45 degrees is the highest acceptable angle).

- No local area dusty conditions due to poor ground cover.

Sites rated 1 meet all of the criteria, i.e., they do not suffer from any of the interferences. When insufficient information is available to conclusively rate a site as 1 or 3, the site is rated as 2. That is, the site fails one or more of the criteria; however, the severity of the local influences could not be assessed from the information available. Whenever possible, a tentative judgment was made to distinguish further with the site rated as 2A or 2B. In the former case, the local interferences are judged to be small or insignificant and the site is termed potentially representative (2A). In the latter case, the local interferences are judged to be more of a problem and the site is termed potentially unrepresentative (2B). In either case, the evaluation of the site did not clearly result in the site being rated as level 1 or 3. A site that was not evaluated is assigned a rating of "blank."

A site judged to be regionally unrepresentative can, and usually does, meet the siting criteria adopted by the network operating the site. Moreover, the network siting criteria may be appropriate for the objectives of the network. Therefore, a site rated 3 can not automatically be assumed to be a "poor" site. It is also possible for a site not to meet its network's siting criteria and still be judged regionally representative. The site representativeness rating does indicate whether the seven criteria are met. It is subject to revision as more information about the site becomes available.

DATA COMPLETENESS MEASURES

Data completeness measures are based on the assumption that the entire season or year consists of sample periods that account for every day of the summary period. It is normal for a site to have incomplete information for some precipitation events during a summary period, to deviate from established collection protocols due to circumstances outside the operator's control, or to collect samples that are subsequently eliminated during the network's data screening process. Therefore, it is necessary to establish criteria for determining when sufficient valid wet deposition data are present to calculate a meaningful seasonal or annual summary for a site. Data completeness measures are designed to quantify the amount of information upon which a data summary is based and enable criteria to be established that indicate the quality of the summary. Five data completeness measures are proposed: percent precipitation coverage length, percent total precipitation, percent valid sample length, percent of samples with measured precipitation that are valid, and percent collection efficiency. A sixth measure, percent sea salt correction is applied to sulfate summaries for sites within 100 km of a coast.

The data completeness measures reflect the type of problems encountered when a data user is confronted with an actual wet deposition monitoring data set. The measures were motivated by the following questions, all of which require an answer for the data completeness and temporal representativeness to be properly assessed: For what portion of the summary period do we know the amount of precipitation that fell?, What portion of the precipitation measured is associated with a valid chemical analysis and valid sample?, What percent of the time during the summary period do these valid samples represent?, What percent of the total number of actual sample periods with measured precipitation do these valid samples represent?, What was the collection efficiency for valid samples, compared to a collocated standard gage, over the summary period?, and What percentage of the sulfate concentration is attributable to sea salt due to a site's proximity to the ocean? Definitions for the six data completeness measures are given in Table 2.2.

The data completeness measures are the basis for assigning a data completeness level (1 to 4) to each seasonal and annual summary (Table 2.3). A summary with data completeness level 1 has the best information, or the highest level of data completeness. The least confidence is given to a summary with data completeness level 3. Level 4 summaries fail level 3 criteria. They are viewed as not providing a representative summary for the period and are not reported in this paper. In order for a data summary to be assigned a specific level, all criteria listed for the level must be met. The most favorable level attained is assigned to the summary. A summary that does not meet one or more of the criteria for level 3 is assigned as level 4.

The collection efficiency data completeness level criteria for a seasonal summary is relaxed somewhat for Canadian winter summaries compared to other seasons due to the generally poorer collector performance for snow sampling. If the criteria for other seasons is applied to winter months when a large percentage of the precipitation in Canada is in the form of snow, then only a few locations meet even the level 3 criterion. It is believed that a lower percentage could be accepted for winter because the problems are primarily due to undercatch of snow. An under-collected snow sample may reasonably represent the concentration but not the deposition.

The data completeness level for an annual summary is based on annual criteria as well as criteria for the four quarters January-March, April-June, July-September, and October-December which comprise the year. The addition of quarterly criteria to the annual criteria is to insure that adequate data from each quarter is present in the annual summary. Because the emphasis is on insuring adequate data for an annual summary, some quarterly criteria are relaxed from the seasonal criteria (see Table 2.3).

TABLE 2.2. Definition of data completeness measures

Data Completeness Measure	Definition
%PCL	Percent precipitation coverage length is the percent of the summary period for which information on whether or not precipitation occurred is available. If precipitation is known to have occurred during a particular sampling period but no measurement of the amount is available, then no knowledge of precipitation is assumed. This measure can be less than 100% because the site started (stopped) operation after (before) the beginning of the summary period or because equipment or operator problems caused the site to be shut down for a portion of the summary period.
%TP	Percent total precipitation is the percent of the total precipitation depth measured that is associated with valid samples collected during the summary period.
%VSL	Percent valid sample length is the percent of the days during the summary period for which valid samples were obtained. Note that sample periods with no precipitation are considered valid samples.
%VSMP	Percent valid samples with measured precipitation is the percent of all wet deposition samples during the summary period that are valid samples.
%COLEFF	Percent collection efficiency is the ratio of the wet deposition sample volume (converted to a depth) to the total precipitation depth as measured by a collocated raingage. Only valid samples with both a collocated standard raingage and sample volume measurement available are used.
%SEASALT	Percent sea salt correction is the percent of the average sulfate concentration that is estimated to be due to sea salt, using sodium or magnesium as tracers of sea salt.

TABLE 2.3 Data completeness level criteria for seasonal and annual summaries

Data Completeness Measure	Seasonal Data Completeness Level 1	2	3
%PCL	≥ 95%	≥ 90%	≥ 90%
%TP, %VSL, %VSMP	≥ 80%	≥ 70%	≥ 60%
%COLEFF			
Winter	≥ 80%(50%)*	≥ 60%(40%)*	≥ 50%(30%)*
Spring, Summer, Autumn	≥ 80%	≥ 60%	≥ 50%
%SEASALT	≤ 25%	≤ 50%	≤ 75%

Data Completeness Measure	Annual Data Completeness Level 1	2	3
%PCL			
Annual and	≥ 95%	≥ 90%	≥ 90%
each quarter	≥ 75%	≥ 60%	≥ 50%
%TP, %VSL, %VSMP			
Annual and	≥ 80%	≥ 70%	≥ 60%
each quarter	≥ 70%	≥ 60%	≥ 50%
%COLEFF			
Annual and	≥ 80%(70%)*	≥ 60%(40%)*	≥ 50%(30%)*
for Winter and	≥ 80%(50%)*	≥ 60%(40%)*	≥ 50%(30%)*
Spring, Summer, Autumn	≥ 80%	≥ 60%	≥ 50%
%SEASALT	≤ 25%	≤ 50%	≤ 75%

*The bracketed value applies to Canadian sites.

OVERALL DATA QUALITY LEVELS

The quality of a data summary is a function of the representativeness of a site and of the completeness of the data on which the summary is based. Other factors also are important in assessing the quality of the individual data values upon which the summary is based. For example, the chemical integrity of the sample between its collection in the field and its analysis by a central analytical laboratory may affect the accuracy of the data. These factors may enter into the valid sample screening process but for current purposes are not explicitly discussed here. In previous sections site representativeness levels and data completeness levels have been introduced as mechanisms to categorize the quality of a data summary. These categorizations necessarily incorporate subjective judgments but they are based on quantitative information. A qualitative assessment of the overall quality of a data summary can be obtained by combining the information in the previous categorizations.

The overall data quality levels defined in Table 2.4 are suggested as one reasonable method of combining the levels. Due to different sample capture efficiencies on an annual, seasonal and individual sampling period basis, and the differing degrees to which "ideal" siting criteria are satisfied at each site, not all data are of the same quality. For the benefit of data users, it was felt that it would be very valuable to distinguish between sites yielding data of different quality. Therefore, four levels of data quality are proposed. "Level 1" data meets the most rigorous screening criteria, and hence is considered to be the best quality. On the other hand, "Level 3" represents what is judged to be the minimum acceptable quality. "Level 4" data do not meet even "Level 3" criteria and are not of sufficient quality to be useful or reported here.

TABLE 2.4. Overall data quality level

Site Representativeness Level	Data Completeness Level			
	1	2	3	4
1	1	2	3	4
2a	2	2	3	4
2	2	2	3	4
2b	2	2	3	4
3	3	3	3	4
no rating	-	-	-	-

SECTION 3

1986 ANNUAL AND SEASONAL DATA SUMMARIES

This section gives an overview of the application of the selection criteria to 1986 data, describes the contents of the data tables in Appendix D, and summarizes some of the characteristics of 1986 wet deposition data by presenting isopleth maps for pH, sulfate, nitrate, ammonium, and calcium.

APPLICATION OF SELECTION CRITERIA

Only those summaries for 1986 that meet the selection criteria (an overall data quality of 3 or less) are reported. Since the data completeness measures are determined for each ion species, it is possible for a data summary to be selected for one ion species but not another for the same site and summary period. The spatial distribution of all sites that operated for a full year in 1986 and the subset of these sites that met the annual selection criteria for sulfate is given in Figure 3.1. A full year of operation is defined as the site successfully monitoring precipitation amount for at least 90 percent of the year. Tables 3.1, 3.2, and 3.3 give, by network, the number of sites operating at some time during the year, the numbers of sites operating for a full year and the number of sites which met the same selection criteria for annual sulfate summaries for the years 1979-1986, respectively. Networks whose sampling period protocol is weekly, four-weekly, or monthly are most likely to have sites that do not meet the selection criteria. CAPMoN, which uses a daily sampling protocol, also has a significant number of sites not meeting the criteria.

TABLE 3.1. Number of sites collecting at least one sample during the year

Network	1979	1980	1981	1982	1983	1984	1985	1986
NADP/NTN	39	82	97	110	142	177	195	203
MAP3S/PCN	8	8	9	9	9	9	9	9
UAPSP	18	10	21	22	25	27	26	25
CAPMoN	0	0	0	0	17	18	24	24
APIOS-D	0	8	16	16	16	17	15	17
APIOS-C	0	30	35	36	38	38	37	38
Total	65	138	178	193	247	286	306	316

TABLE 3.2. Number of sites monitoring precipitation at least 90 percent of the year

Network	1979	1980	1981	1982	1983	1984	1985	1986
NADP/NTN	21	36	73	89	102	139	179	187
MAP3S/PCN	8	8	9	9	9	9	9	9
UAPSP	18	6	6	21	20	19	21	24
CAPMoN	-	-	-	-	7	17	18	21
APIOS-D	-	-	12	16	16	14	14	13
APIOS-C	-	-	30	33	32	34	32	36
Total	47	50	130	168	186	232	273	290

TABLE 3.3. Number of sites meeting annual selection criteria for sulfate

Network	1979	1980	1981	1982	1983	1984	1985	1986
NADP/NTN	16	26	53	60	71	85	101	115
MAP3S/PCN	5	7	8	9	8	9	9	9
UAPSP	16	6	6	21	20	18	19	21
CAPMoN	-	-	-	-	4	11	11	17
APIOS-D	-	-	-	-	10	10	11	11
APIOS-C	-	-	10	14	22	21	20	22
Total	37	39	77	104	135	154	171	195

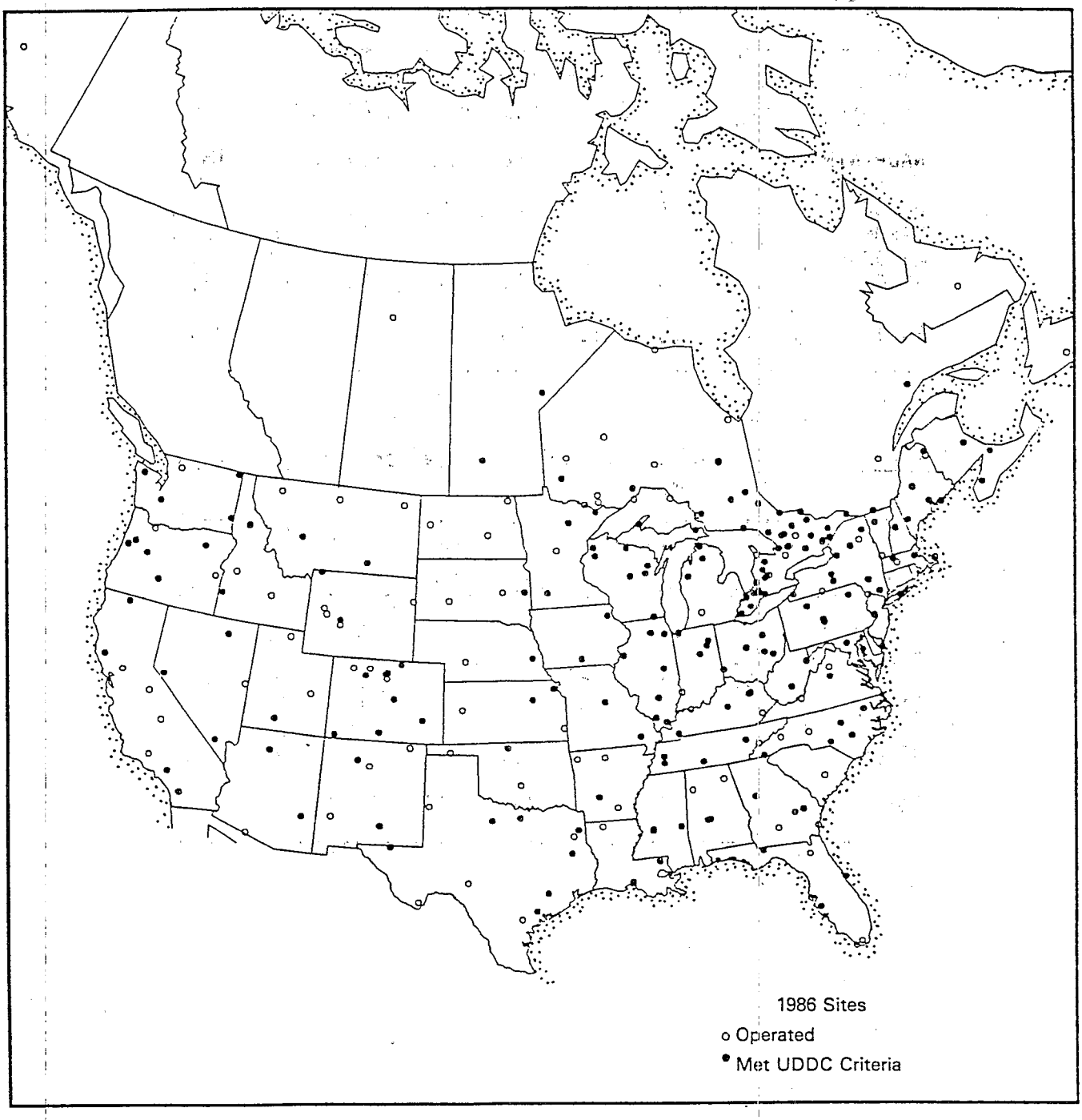


FIGURE 3.1 Geographic location of sites in 1986 operating a full year and the subset of sites meeting annual UDDC criteria for sulfate

CONTENT OF DATA TABLES

Appendix D contains data tables of ion species statistical summaries by individual site for calendar year 1986 and for the four 1986 climatological seasons (winter: December 1985, January, February 1986, spring: March, April, May 1986, summer: June, July, August 1986, and autumn: September, October, November 1986). The summaries are arranged by ion species and within ion species by summary period (annual first, then winter, spring, summer, and autumn seasons). The ion species included are pH and hydrogen (derived from pH), sulfate, nitrate, ammonium, calcium, magnesium, potassium, sodium and chloride. Summary values reported in the tables are the data completeness measures, site representativeness rating, data completeness rating and overall data quality rating, number of valid samples, number of valid samples below the detection limit, total precipitation, precipitation weighted average concentration and deposition. Although not contained in this report, data summary tables giving the ion species concentration distribution properties are available from ADS. Specifically, ion species concentration distribution properties summarized in these tables are the geometric mean, standard deviation of logarithms, arithmetic mean and standard deviation, the minimum and maximum valid sample value, the 25th, 50th, and 75th percentile and Lilliefors D-statistic to test for normality and log-normality of the concentration distribution. All values displayed in the tables are also available from ADS in computerized data file formats.

The algorithms for constructing the data summaries are applied to data contained in the ADS data base and utilize the concepts described in Section 2. The exact procedures used are contained in the Unified Wet Deposition Data Summaries for North America: Data Summary Procedures and Results for 1984 by Olsen et. al. (1987). Because of the number of possible definitions, the procedures for calculating precipitation depth, total precipitation, precipitation weighted concentration, and deposition are described here.

Precipitation depth has a specialized meaning. Precipitation depth for a single sample is equal to the reported rain gage depth. If the rain gage depth is not reported, precipitation depth is equal to the predicted depth based on the sample volume and surface area of the collector. Total precipitation is the sum of the precipitation depths for all sample periods with measured precipitation during the summary period. Precipitation weighted average concentration is the weighted average of all valid concentration values where the weights are the corresponding sample precipitation depth values. Deposition is the product of the precipitation weighted average concentration and the total precipitation during the summary period.

ISOPLETH MAPS FOR 1986

The 1986 annual spatial pattern for pH (Figure 3.2) shows pH values below 5.0 for the eastern half of North America and pH values greater than 5.0 for western half, except for the Southwest and southern Rocky Mountain region. An ellipsoid area of low pH (<4.2) extends from mid-Ohio and mid-West Virginia to western New York and from the southern Ontario border to eastern Pennsylvania and northern Virginia. Fourteen sites have a pH value below 4.2

and the lowest two values are 4.12 at Kane, Pennsylvania and Parsons, West Virginia (Table 3.4). The maximum pH is 5.66 at Las Animas in southeastern Colorado. The 1986 and 1985 pH spatial patterns have very similar isopleth lines for 4.2 to 4.8. The 5.0 contour line differs but the change appears to be related to the availability of more sites in 1986, especially in Colorado.

The winter and summer spatial patterns for pH (Figures 3.3 and 3.4) are different and differ from the annual pattern. In winter, the area of low pH (<4.2) is larger than the annual region and extends from western Ohio to western New York and Pennsylvania and from northern Virginia to northern portion of southern Ontario. pH values below 5.0 occur east of a line from New Mexico to northern Minnesota. The location of the 5.0 isopleth line is difficult to determine due to the low density of sites in the area. The minimum winter pH is 4.04 at Chautauqua, New York, and the maximum winter value is 5.75 at Smith Valley, Nevada. In summer, the area of low pH (<4.2) extends from northeastern border of Kentucky to the western border of Maine and from mid-Virginia to northern New York. A region with pH below 4.0 extends from central Pennsylvania to northern West Virginia. Summer has a region of pH below 5.0 extending from southern Wyoming and western Colorado to the Mexican border, and from California to western New Mexico. The minimum summer pH is 3.91 at Penn State, Pennsylvania and the maximum summer value is 6.09 at Huron Well Field, South Dakota. Forty sites have summer pH values below 4.2.

The 1986 spatial pattern for hydrogen ion deposition (Figure 3.2) has the region of greatest deposition (>0.6 kg/ha) over West Virginia, eastern Ohio, Pennsylvania, New York, southern Vermont, western Massachusetts, and Connecticut. The region with deposition greater than 0.6 kg/ha is larger than in 1985. Although the isopleth lines give the impression of a reasonably smooth deposition surface, the spatial estimation procedure has smoothed the substantial site-to-site variation in the high deposition area. For example, Sutton, Quebec has a deposition of 0.86 kg/ha and a number of sites with deposition greater than 0.6 kg/ha in southern Ontario are intermixed with sites with deposition less than 0.6 kg/ha. The maximum annual hydrogen deposition is 1.02 kg/ha at Parsons, West Virginia. Other sites with deposition greater than 0.8 kg/ha are Kane and Leading Ridge, Pennsylvania and Bennett Bridge, New York.

The 1986 winter and summer hydrogen deposition spatial patterns (Figures 3.3 and 3.4) both have their highest deposition regions in western Pennsylvania. Approximately twice the deposition occurs in summer than in winter (Table 3.5). Sites with the highest summer deposition are Parsons, West Virginia (0.46 kg/ha); Kane, Pennsylvania (0.41 kg/ha); Chautauqua, New York (0.36 kg/ha); Leading Ridge, Pennsylvania (0.36 kg/ha); and Bennett Bridge, New York (0.35 kg/ha). Sites with the highest winter deposition are Kane, Pennsylvania (0.19 kg/ha); Chautauqua, New York (0.17 kg/ha); Parsons, West Virginia (0.15 kg/ha), Priceville, Ontario (0.15 kg/ha); and West Point, New York (0.15 kg/ha).

Sulfate Spatial Patterns

The spatial pattern for 1986 annual sulfate concentration (Figure 3.5) is typified by high concentrations in central eastern North America and by low concentrations elsewhere. An elliptical region centered in eastern Ohio has concentrations greater than 3.5 mg/L. The highest concentration is 3.96 mg/L at Parsons (Table 3.4). Eight other sites with concentrations greater than 3.5 mg/L are in Southern Ontario, New York, Pennsylvania, and Ohio. A contour line for concentrations greater than 2.0 mg/L extends from western Illinois to the East Coast and from Tennessee to Southern Ontario.

Sulfate annual deposition has a spatial pattern similar to sulfate concentration (Figure 3.5). A contour line for annual deposition greater than 35 kg/ha extends from northern West Virginia to north of Lake Ontario and from the eastern Ohio border to western Pennsylvania and western New York. The maximum deposition is 53.3 kg/ha at Parsons, West Virginia (Table 3.5). Four additional sites have sulfate depositions between 40 and 45 kg/ha: Bennett Bridge and Chautauqua, New York; Kane, Pennsylvania; and Wellesley, Ontario. The 20 kg/ha contour line encloses an elliptical region from northern Alabama and Georgia to Southern Ontario and New Hampshire and from eastern Wisconsin and central Illinois to eastern Virginia and Massachusetts.

Winter sulfate concentrations have a spatial pattern with the highest concentration region shifted further west than for the annual (Figure 3.6). The 3.0 mg/L contour line encloses two regions: one centered in northwestern Illinois and one centered in northern Ohio, south Southern Ontario, northwestern Pennsylvania, and western tip of New York. The maximum winter concentrations are 4.29 mg/L at Wilkesport, Ontario; 3.96 mg/L at Argonne, Illinois; 3.69 mg/L at Merlin, Ontario; and 3.51 mg/L at Port Stanley, Ontario. Parsons, the location of the highest annual concentration, has a concentration of 3.39 mg/L. Winter sulfate concentrations are lower in eastern New York and New England when compared to annual concentrations.

The spatial pattern for summer sulfate concentration differs markedly from the annual and winter patterns (Figure 3.7). A primary difference is that summer concentrations are consistently higher compared to winter or annual. The region enclosed by the 2.0 mg/L contour for annual concentration is similar to the region enclosed by the 3.0 mg/L contour for summer concentration. The highest concentrations, 5.0 mg/L contour, occur in western Pennsylvania and northern West Virginia. The maximum summer concentration is 5.50 mg/L at Penn State (sampler operated by MAP3S network). Other concentrations greater than 5.0 mg/L are 5.42 mg/L at Penn State (NADP/NTN sampler), 5.22 mg/L at Leading Ridge, 5.07 mg/L at Parsons, and 5.02 mg/L at Kane. Dana and Easter (1987) discuss the existence of a seasonal cycle for sulfate concentration. Although the concentration levels are lower, sulfate concentrations are also higher in summer than in winter in the Western United States.

Winter sulfate deposition is highest (>5.0 kg/ha) in western Pennsylvania, eastern Ohio, and northern West Virginia (Figure 3.6). This is the same region for high annual deposition, except it does not include western New York. Deposition is less than 2.0 kg/ha west of the Mississippi

River. The maximum winter deposition is 8.7 kg/ha at Parsons (Table 3.5). The next two highest deposition sites are Chautauqua (6.4 kg/ha) and Kane (5.8 kg/ha). Two sites among those with high winter deposition are American Samoa (5.6 kg/ha) and El Verde, Puerto Rico (5.4 kg/ha), both influenced by sea salt. The effect of sulfate associated with sea salt is apparent in the relatively high deposition along the northern United States coast.

Summer sulfate deposition greater than 15.0 kg/ha occurs from southeastern Southern Ontario and eastern Ohio to central West Virginia, central Pennsylvania and most of New York (Figure 3.7). Deposition is less than 5.0 kg/ha west of the Mississippi River. The maximum summer deposition of 23.9 kg/ha occurs at Parsons, the same location as the winter maximum (Table 3.5). Kane with 20.6 kg/ha is the only other site with summer deposition greater than 20.0 kg/ha. Only sites in West Virginia, Pennsylvania, New York, and Southern Ontario have depositions greater than 15.0 kg/ha. To provide a contrast with winter, the summer sulfate depositions at American Samoa and El Verde are 2.0 and 7.0 kg/ha, respectively. The influence of sea salt is less noticeable during summer. Summer sulfate deposition is approximately three times winter sulfate deposition. The difference is partially a function of the higher summer concentrations and partially a function of greater summer precipitation amounts.

Nitrate Spatial Patterns

The spatial pattern for 1986 annual nitrate concentration (Figure 3.8) has a nearly circular region of high concentration centered on Lake Ontario. In contrast to the sulfate concentration pattern, a contour line at 1.0 mg/L extends across the northern Great Plains to Colorado. One explanation for the higher concentrations in this region is the influence of agricultural activities. The maximum concentration is 2.72 mg/L at Killarney, Ontario. In fact, the ten highest concentrations, all greater than 2.30 mg/L, occur in Southern Ontario.

Annual nitrate deposition has essentially the same spatial pattern as nitrate concentration but locally is more variable (Figure 3.8). A 25.0 kg/ha contour encloses a small region centered at the northern tip of Lake Ontario. Eight sites have nitrate depositions greater than 25.0 kg/ha: Bennett Bridge, Parsons, Chautauqua, and West Point in the United States, and Wellesley, North Easthope, Huron Park, and Sutton in Canada. Bennett Bridge has the maximum deposition at 32.4 kg/ha.

Winter nitrate concentrations are greater than annual concentrations in the highest concentration region (Figure 3.9). A 3.5 mg/L contour encloses a narrow region along Lake Ontario extending from Detroit to the eastern tip of Ontario. Of eighteen sites with concentrations greater than 3.5 mg/L, only Chautauqua and Huntington, New York are in the United States. Charlottesville, Virginia is the only additional United States site among sites with concentrations greater than 3.0 mg/L, all other sites are in Southern Ontario. The maximum winter nitrate concentration is 5.17 mg/L at Wilkesport, Ontario, located at the southern end of Lake Huron.

Summer nitrate concentrations are generally comparable to annual nitrate concentrations in magnitude and spatial pattern in high concentration regions (Figure 3.10 and Table 3.4). Differences in the spatial pattern occur for the 2.0 mg/L contour where the summer contour extends to the Atlantic coast and for the 1.0 mg/L contour where the summer contour extends further south to the coast of Louisiana and across the west to the Pacific Ocean. The maximum summer concentration is 3.04 mg/L at West Point. The next highest values are 2.91 mg/L at Tanbark Flat, California, northeast of Los Angeles; 2.79 mg/L at Balsam Lake, Ontario; and 2.71 mg/L at White Rock, Maryland. Winter nitrate concentrations are higher than summer concentrations in the Northeast but summer concentrations are higher than winter in the South and West.

The geographic region enclosed by the 3.0 kg/ha contour for winter nitrate deposition is comparable to the region enclosed by the 15.0 kg/ha contour for annual nitrate deposition. The region with maximum winter deposition (>6.0 kg/ha) is the same region as for maximum annual depositions. The maximum deposition is 9.4 kg/ha at Priceville, Ontario. Only Chautauqua (7.8 kg/ha), Kane (7.2 kg/ha), Parsons (6.6 kg/ha) in the United States have depositions greater than 6.0 kg/ha, all other sites are in Southern Ontario. During the winter, deposition less than 1.0 kg/ha occurs west of the Mississippi River and in Florida.

Summer nitrate depositions are greater than winter nitrate depositions (Figure 3.10 and Table 3.5). The 5.0 kg/ha contour line for summer deposition encloses the same region as the 15.0 kg/ha contour line for annual deposition. Approximately one third of the annual deposition occurs during the summer. Summer nitrate deposition is greater than 1.0 kg/ha east of the Rocky Mountain region. In Florida, nitrate deposition during the summer accounts for most of the annual deposition. Greater summer deposition is related to higher summer concentrations and larger precipitation amounts compared to winter. The maximum summer nitrate deposition is 12.2 kg/ha at West Point. Other sites with deposition greater than 9.0 kg/ha are Chautauqua, Kane and Parsons in the United States, and Uxbridge, Huron Park, Wellesley, and Waterloo in Ontario.

Ammonium Spatial Pattern

Annual 1986 ammonium concentration has a spatial pattern dominated by a high concentration region centered in the northern Great Plains and another centered in the southern tip of Southern Ontario (Figure 3.11). Ammonium concentrations greater than 0.20 mg/L extend from the Rocky Mountains to Vermont and the Atlantic coast and from Nebraska, Arkansas, Tennessee, and North Carolina into Canada. Although the annual nitrate concentration spatial pattern is similar to that of ammonium, it does not have the second high concentration region in the west. The maximum concentration in the western region is 0.71 mg/L at Brookings, South Dakota, and in the Ontario region is 0.73 mg/L at Colchester. Other sites with annual ammonium concentrations greater than 0.50 mg/L are Lamberton, Minnesota; Pawnee, Colorado; Shawano, Wisconsin; and Mead, Nebraska in the west; and Palmerston, Wellesley, Huron

Park, Waterloo, Merlin, Wilkesport, Melbourne, North Easthope, and Longwoods in Ontario.

The annual ammonium deposition spatial pattern also has two regions of high deposition (Figure 3.11). In addition, deposition is greater than 1.0 kg/ha east of the Rocky Mountains, except for Florida. Note that the 2.0 kg/ha contour extends south to the Gulf Coast in Texas, Louisiana, and Mississippi. The maximum deposition is 7.50 kg/ha at Wellesley, Ontario (Table 3.5). Five other sites in Southern Ontario have depositions greater that 6.0 kg/ha. The highest deposition in the West is 5.39 kg/ha at Brookings, South Dakota. Mead, Nebraska, and Lamberton, Minnesota also are western sites with deposition greater than 5.0 kg/ha.

Winter ammonium concentrations are comparable to, or slightly less than, annual concentrations (Table 3.4). The spatial pattern has high concentrations in Northern Illinois, north of Lake Huron, and in Southern Ontario (Figure 3.12). No annual summaries meet the UDDC selection criteria to determine if a secondary maximum in South Dakota exists. The site-to-site variation in the winter suggests possible local influences for ammonium. The maximum winter concentration is 0.75 mg/L at Waterloo.

Summer ammonium concentrations show substantial geographic variation (Figure 3.12). Although Southern Ontario and the northern Great Plains remain high concentration regions, high concentrations also are present in Nevada, Colorado, western Kansas, and Mississippi (relative to nearby region). The maximum concentration is 0.97 mg/L at Colchester, Ontario. The next highest, and the maximum concentration in the United States, is 0.75 mg/L at Pawnee, Colorado. In Nevada, the maximum is 0.46 mg/L at Lehman Caves. This contrasts with a winter ammonium concentration of 0.04 mg/L at Lehman Caves.

The center of the region with the highest ammonium deposition in winter is the southern tip of Southern Ontario (Figure 3.12). Sites with deposition greater than 1.00 kg/ha are Priceville (1.40), Priceville 2 (1.11), Waterloo (1.06), and McKellar (1.01) in Ontario, and Chautauqua (1.14) in New York. Note that the two Priceville sites are co-located and the difference in the values demonstrates the variation possible in estimating annual deposition at a site. Winter accounts for less than one-fourth of the annual ammonium deposition.

Summer ammonium deposition is approximately three times greater than winter deposition (Table 3.5 and Figure 3.13). Approximately, one-third of the annual ammonium deposition occurs during the summer. Summer has two high deposition regions, similar to the annual spatial pattern. The maximum deposition is 4.06 kg/ha at Colchester. The next highest deposition is 2.78 at Huron Park. Other sites with deposition greater than 2.00 kg/ha are Palmerston, Waterloo, Merlin, Wellesley, Uxbridge, and North Easthope in Ontario, and Fort Wayne, Indiana. The secondary maximum is 1.59 kg/ha at Brookings, South Dakota.

Calcium Spatial Patterns

The spatial pattern for 1986 annual calcium concentration differs from the corresponding spatial patterns for hydrogen, sulfate, nitrate and ammonium (Figure 3.14). The high concentration region is still centered in the southern tip of Southern Ontario, but the contour lines tend to extend southwest to the Mexican border. This is a reflection of calcium arising from a non-anthropogenic source, soil-related. The maximum concentration is 0.62 mg/L at Longwoods, Ontario (Table 3.4). Other sites with concentrations greater than 0.40 mg/L are Wilkesport, Melbourne, Wellesley, and Merlin, all in Ontario. The maximum concentration in the United States is 0.38 mg/L at Red Rock Canyon, Nevada.

Annual calcium deposition has a spatial pattern with two maxima: one in Southern Ontario, the location of the concentration maximum, and the other in eastern Kansas (Figure 3.14). The maximum deposition is 5.96 kg/ha at Longwoods, Ontario (Table 3.5). Fourteen sites have annual deposition greater than 3.0 kg/ha, all but three sites located in Southern Ontario. The three sites are El Verde, Puerto Rico; Konza Prairie, Kansas; and Parsons, West Virginia.

The spatial pattern for winter calcium concentration has many of the same features as the annual pattern (Figure 3.15). Differences in the sites used for contouring make a direct comparison difficult. The maximum concentration is 1.14 mg/L at Moonbeam in northern Ontario. Since a nearly co-located site has a concentration of 0.08 mg/L, the high concentration is likely to be due to local sources or contamination. The second highest concentration is 0.85 mg/L at Merlin, Ontario. The highest concentration in the United States is 0.67 mg/L at Indiana Dunes, Indiana, and in the western United States is 0.37 at Mesa Verde, Colorado.

Summer Calcium concentrations are similar to annual concentrations in the high concentration area in Southern Ontario and are substantially greater in Southern California, Nevada, Arizona, and Texas (Figure 3.16). The maximum concentration is 1.16 mg/L at Palomar Mountain, California. The second highest concentration is 0.89 mg/L at Longwoods, Ontario. In all, six sites in Ontario, six sites in the western and southwestern United States, and two in northern Illinois and Indiana have concentrations greater than 0.40 mg/L.

The spatial pattern for winter calcium deposition has a high deposition region centered in Southern Ontario and extending to northern Illinois (Figure 3.15). Within this region, deposition in winter accounts for 20 percent or less of the annual deposition. The maximum deposition, however, is 1.39 kg/ha at Parsons, West Virginia. Deposition greater than 0.50 kg/ha occurs at fifteen sites, ten located in Ontario. In addition to Parsons, the other sites not in Ontario are American Samoa; El Verde, Puerto Rico; and Indiana Dunes and Huntington, Indiana.

The summer calcium deposition spatial pattern is more variable and has several regions of secondary maxima (Figure 3.16). The pattern is similar the annual pattern, in part due to the summer quarter contributing the most to the annual deposition in high deposition regions. The maximum deposition

is 2.49 kg/ha at Longwoods, Ontario. The maximum in the United States is 1.43 kg/ha at Farlington, Kansas.

TABLE 3.4. Frequency distribution percentiles for annual and seasonal ion species concentration

		Number of Sites	Min	5	10	25	50	75	90	95	Max
pH											
	Annual	186	4.11	4.17	4.22	4.31	4.51	4.90	5.36	5.44	5.66
	Winter	188	4.04	4.11	4.17	4.39	4.52	4.90	5.33	5.46	5.75
	Spring	245	4.05	4.21	4.24	4.35	4.57	5.26	5.63	5.83	6.54
	Summer	243	3.91	4.07	4.12	4.25	4.50	4.96	5.37	5.56	6.09
	Fall	246	4.12	4.22	4.26	4.38	4.61	4.99	5.33	5.50	6.73
Sulfate (mg/L)	Annual	195	0.14	0.30	0.53	1.11	1.88	2.60	3.21	3.48	3.96
	Winter	188	0.01	0.16	0.24	0.63	1.30	2.06	2.75	3.30	4.96
	Spring	257	0.20	0.38	0.49	1.10	1.95	2.88	3.50	3.81	4.75
	Summer	243	0.30	0.55	0.70	1.03	1.84	3.19	4.02	4.50	5.50
	Fall	241	0.14	0.30	0.50	0.82	1.37	2.05	2.66	2.85	2.61
Nitrate (mg/L)	Annual	193	0.02	0.22	0.45	0.76	1.19	1.80	2.11	2.33	2.72
	Winter	189	0.01	0.09	0.24	0.54	1.31	2.40	3.49	3.92	5.17
	Spring	256	0.20	0.38	0.49	1.10	1.95	2.88	3.50	3.81	4.75
	Summer	245	0.30	0.55	0.70	1.03	1.84	3.19	4.02	4.50	5.50
	Fall	240	0.04	0.25	0.37	0.55	0.88	1.37	1.78	1.95	2.46
Ammonium (mg/L)	Annual	194	0.01	0.03	0.06	0.14	0.25	0.36	0.48	0.57	0.73
	Winter	187	0.01	0.01	0.02	0.06	0.17	0.30	0.43	0.55	0.75
	Spring	256	0.01	0.04	0.09	0.19	0.35	0.50	0.68	0.74	1.08
	Summer	245	0.01	0.04	0.06	0.13	0.23	0.37	0.50	0.58	0.97
	Fall	236	0.01	0.03	0.05	0.09	0.16	0.28	0.40	0.47	0.72
Calcium (mg/L)	Annual	196	0.02	0.04	0.04	0.09	0.14	0.22	0.30	0.34	0.62
	Winter	185	0.01	0.02	0.02	0.05	0.09	0.16	0.30	0.46	1.14
	Spring	252	0.01	0.05	0.08	0.13	0.21	0.32	0.45	0.60	0.97
	Summer	243	0.01	0.04	0.05	0.10	0.17	0.25	0.35	0.51	1.16
	Fall	240	0.01	0.02	0.03	0.05	0.09	0.14	0.21	0.28	1.11

TABLE 3.5. Frequency distribution percentiles for annual and seasonal ion species deposition

		Number of Sites	Min	5	10	25	50	75	90	95	Max
Hydrogen (kg/ha)	Annual	186	0.003	0.012	0.032	0.101	0.300	0.484	0.650	0.732	1.018
	Winter	188	0.000	0.002	0.006	0.024	0.070	0.114	0.160	0.180	0.274
	Spring	245	0.000	0.001	0.003	0.010	0.054	0.101	0.127	0.153	0.203
	Summer	243	0.000	0.002	0.005	0.024	0.091	0.178	0.254	0.305	0.459
	Fall	246	0.001	0.002	0.004	0.017	0.043	0.085	0.111	0.131	0.194
Sulfate (kg/ha)	Annual	195	0.40	1.98	2.82	10.90	16.90	26.70	32.00	35.84	53.30
	Winter	188	0.00	0.41	0.70	1.90	3.90	5.70	8.00	8.89	12.80
	Spring	257	0.10	0.30	0.70	1.95	4.60	6.05	7.52	8.40	11.50
	Summer	243	0.00	0.34	0.80	2.30	5.40	10.00	13.90	16.08	23.90
	Fall	241	0.00	0.10	0.20	1.00	2.00	3.40	4.40	5.20	8.70
Nitrate (kg/ha)	Annual	193	0.07	1.51	1.90	6.90	10.70	17.45	22.80	24.59	32.40
	Winter	189	0.00	0.40	0.50	1.20	2.40	3.60	5.29	6.00	8.80
	Spring	256	0.10	0.29	0.40	1.23	2.85	4.30	5.30	6.11	8.70
	Summer	245	0.00	0.33	0.80	2.00	3.30	5.40	7.04	8.17	12.20
	Fall	240	0.00	0.20	0.30	0.75	1.60	3.75	5.50	6.40	9.40
Ammonium (kg/ha)	Annual	194	0.11	0.26	0.38	1.25	2.27	3.60	4.90	5.40	7.50
	Winter	187	0.01	0.06	0.08	0.21	0.40	0.73	1.13	1.36	2.55
	Spring	256	0.03	0.05	0.09	0.33	0.70	1.10	1.50	1.64	2.81
	Summer	245	0.00	0.05	0.11	0.28	0.63	1.12	1.64	1.92	4.06
	Fall	236	0.00	0.02	0.03	0.10	0.20	0.40	0.67	0.79	1.40
Calcium (kg/ha)	Annual	196	0.12	0.34	0.41	0.75	1.27	1.97	2.74	3.46	5.96
	Winter	185	0.01	0.04	0.08	0.12	0.20	0.33	0.55	0.75	1.99
	Spring	252	0.01	0.09	0.14	0.23	0.42	0.65	0.91	1.12	2.00
	Summer	243	0.00	0.06	0.13	0.24	0.41	0.70	0.98	1.23	2.49
	Fall	240	0.00	0.03	0.04	0.07	0.13	0.23	0.40	0.73	1.39

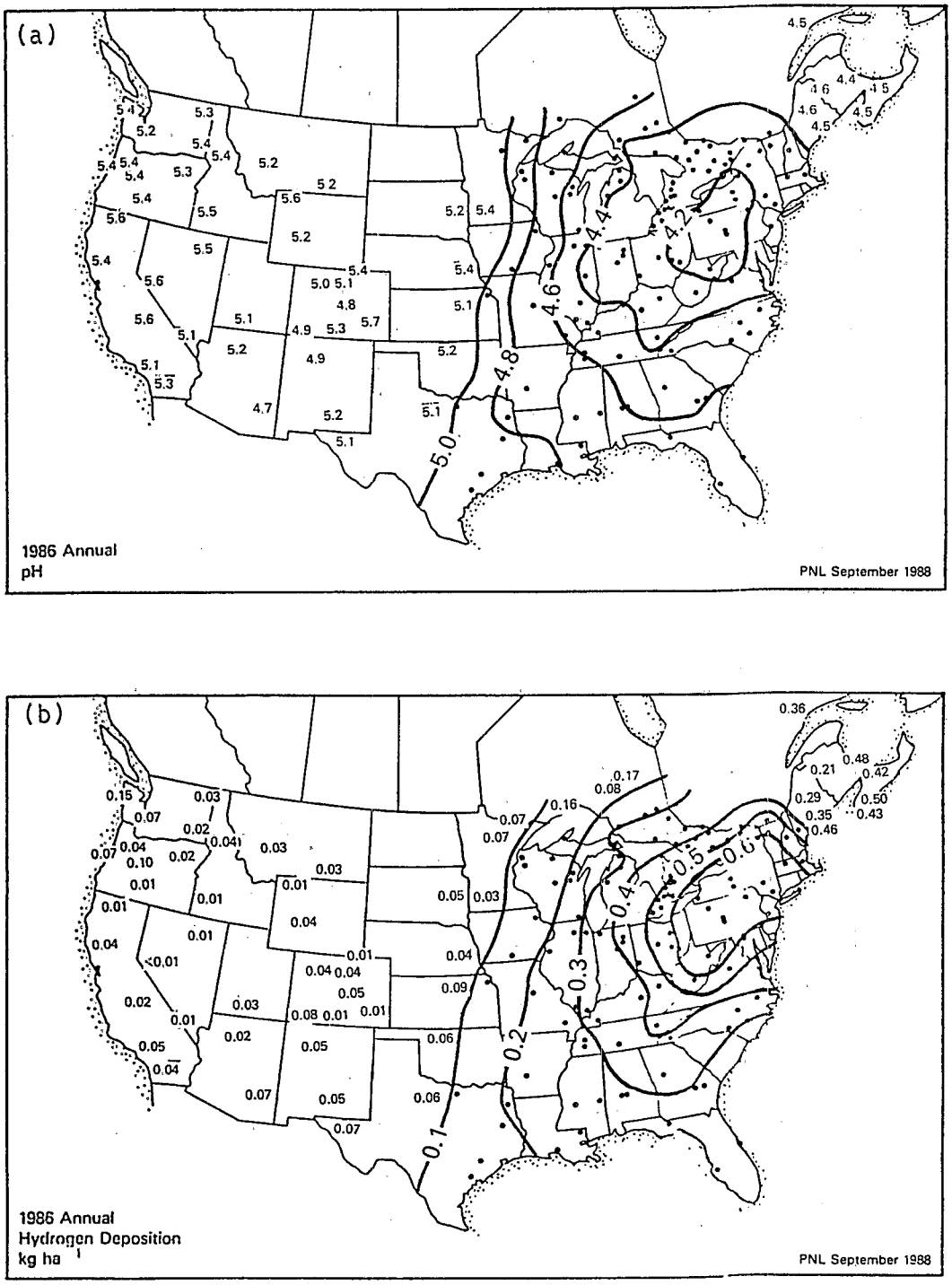
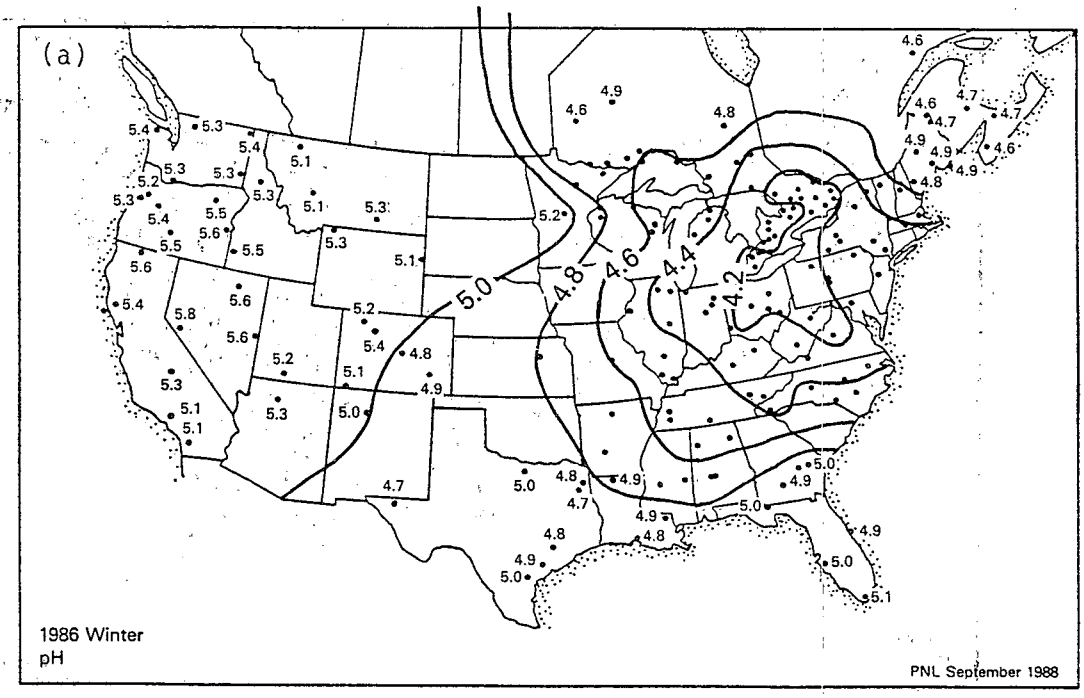


FIGURE 3.2 Annual 1986 spatial distribution of (a) precipitation-weighted pH and (b) hydrogen ion deposition



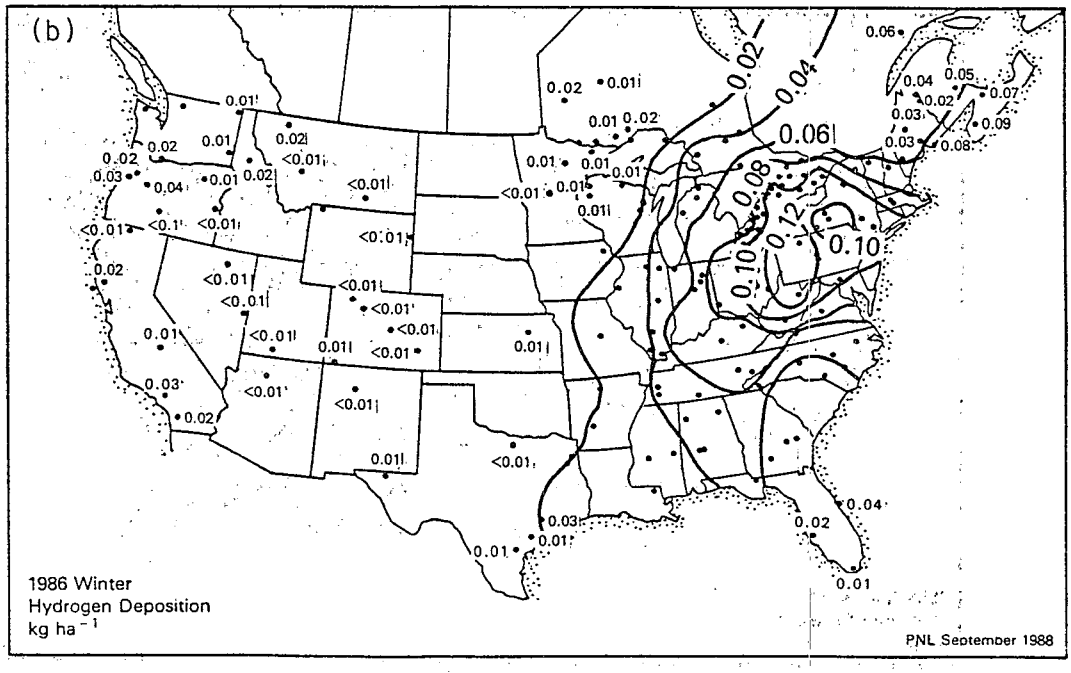


FIGURE 3.3 Winter 1986 spatial distribution of (a) precipitation-weighted pH and (b) hydrogen ion deposition

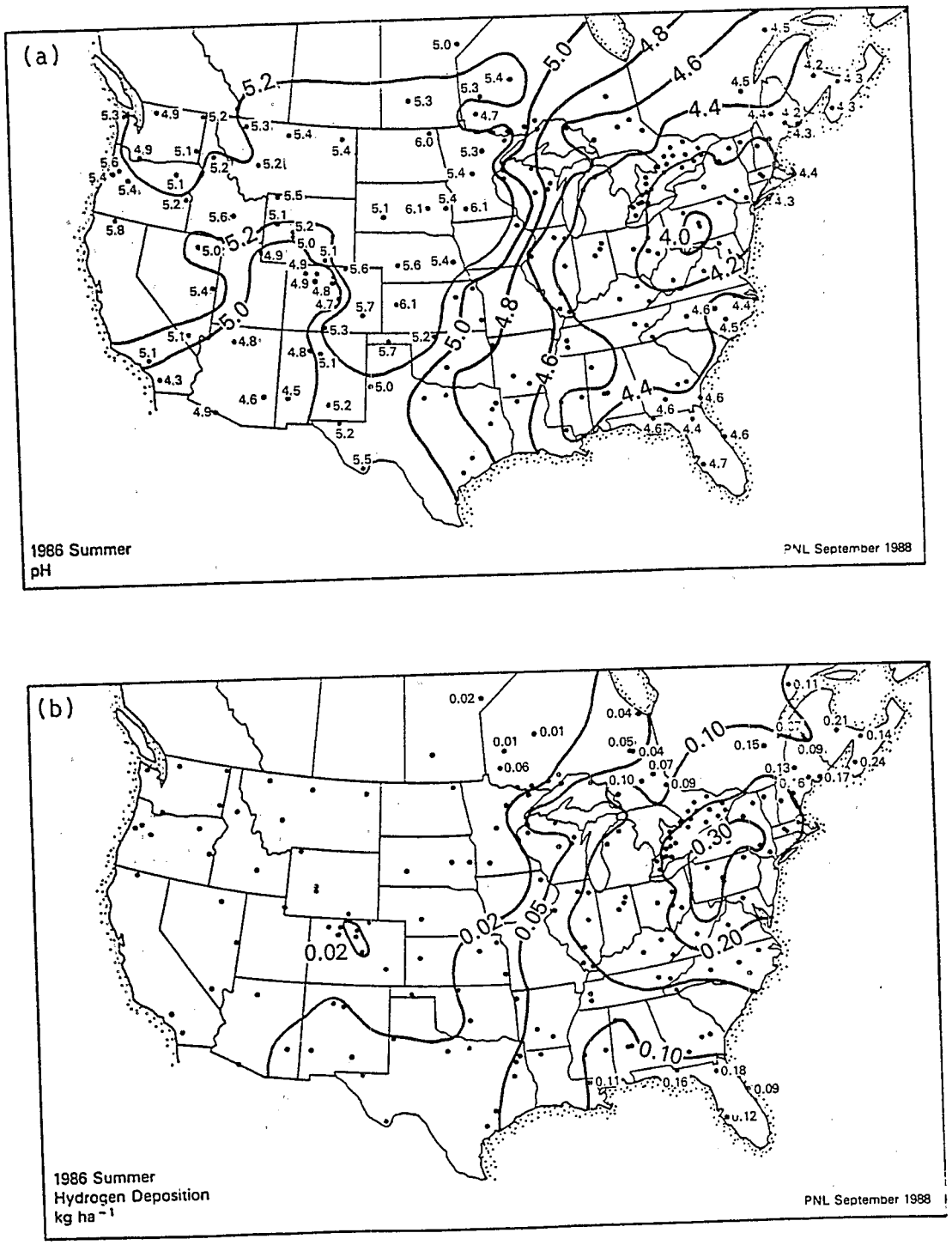
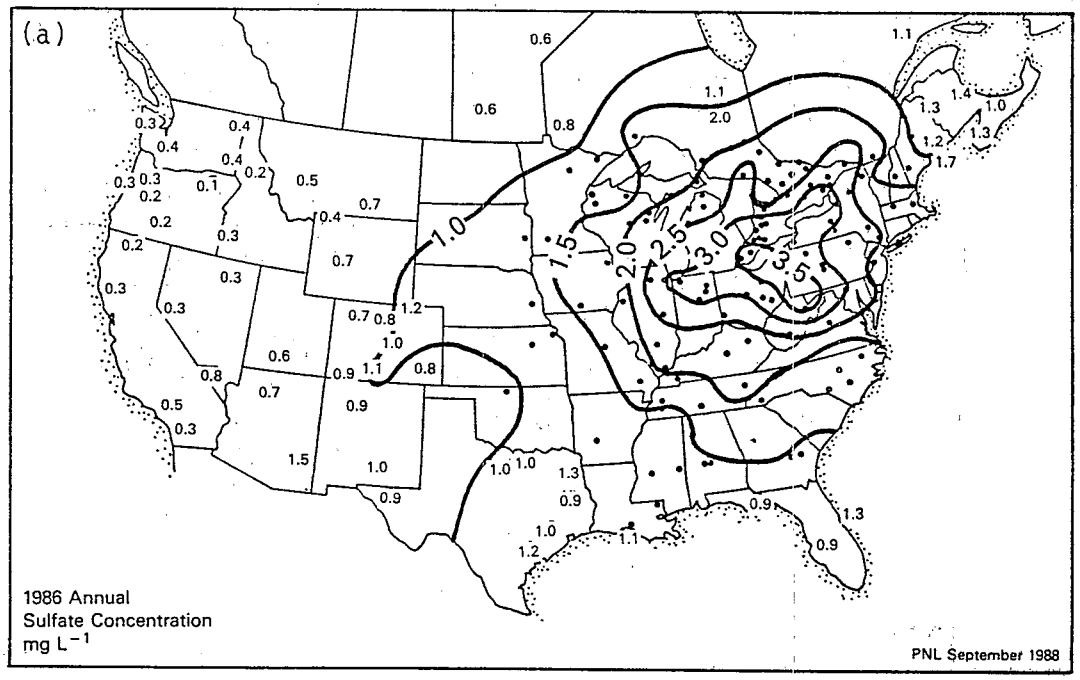


FIGURE 3.4 Summer 1986 spatial distribution of (a) precipitation-weighted pH and (b) hydrogen ion deposition



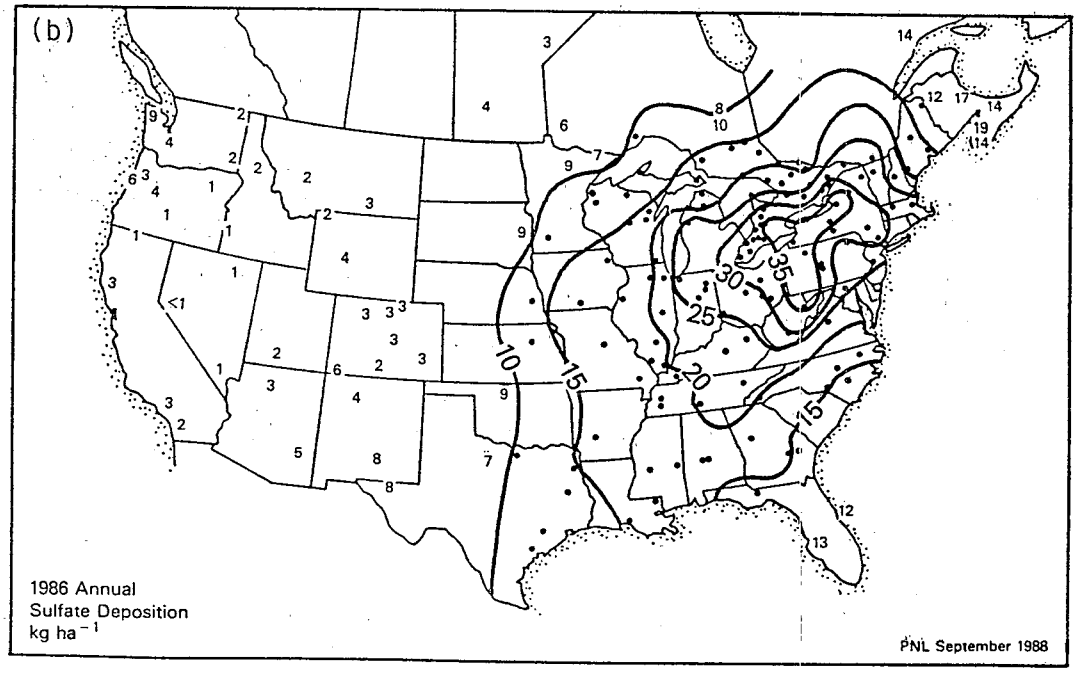
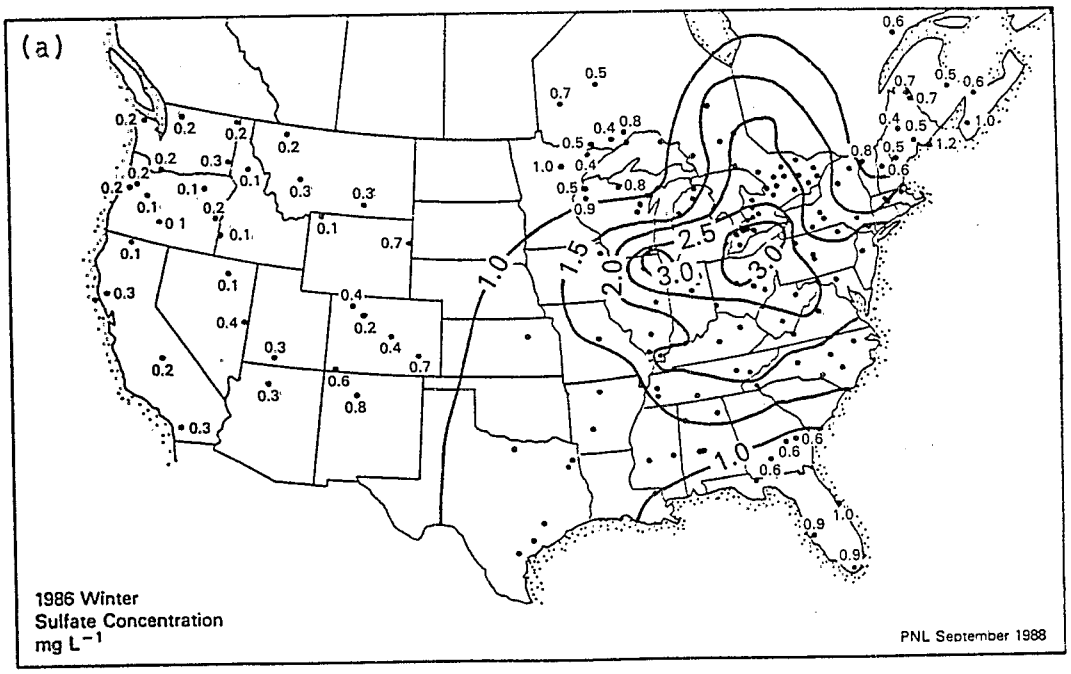


FIGURE 3.5 Annual 1986 spatial distribution of sulfate (a) precipitation-weighted concentration and (b) deposition



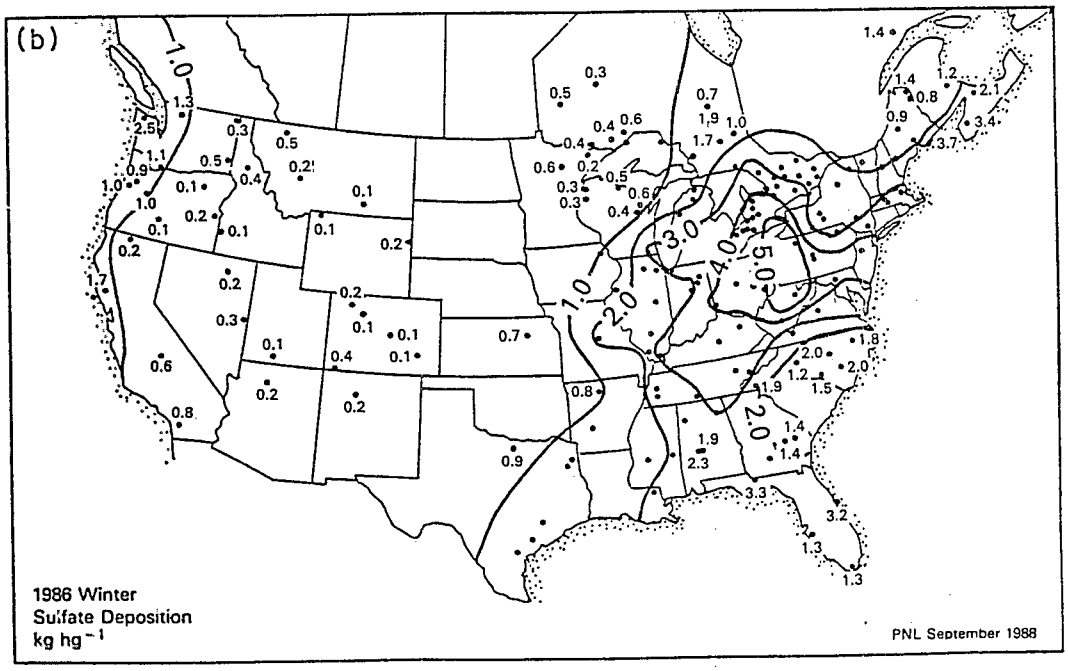
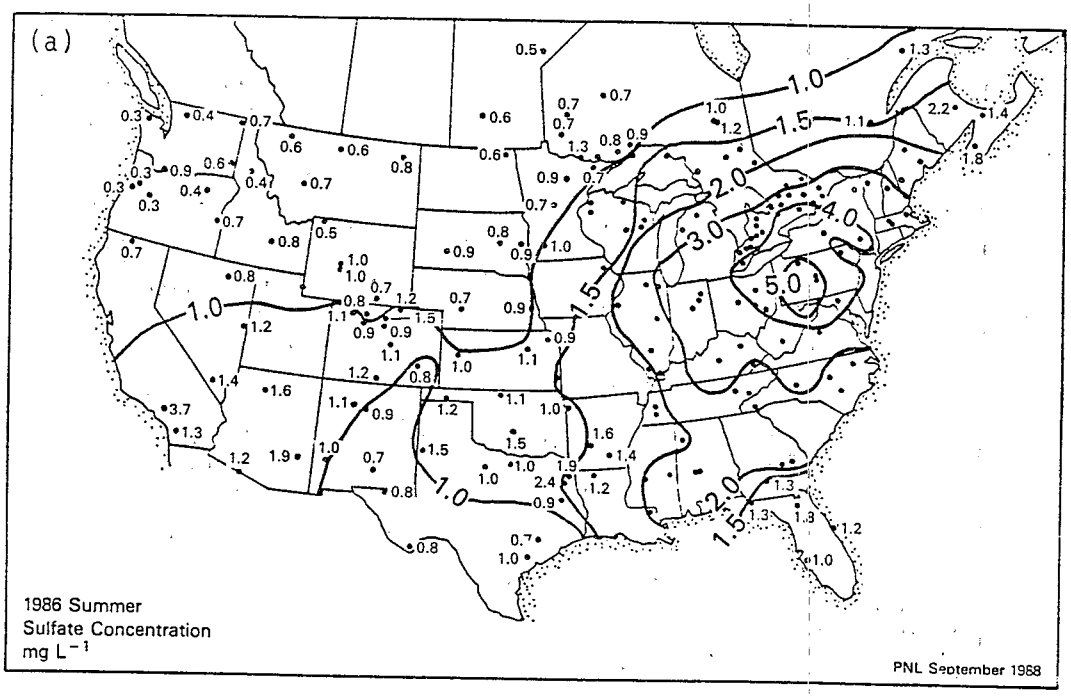


FIGURE 3.6 Winter 1986 spatial distribution of sulfate (a) precipitation-weighted concentration (b) deposition



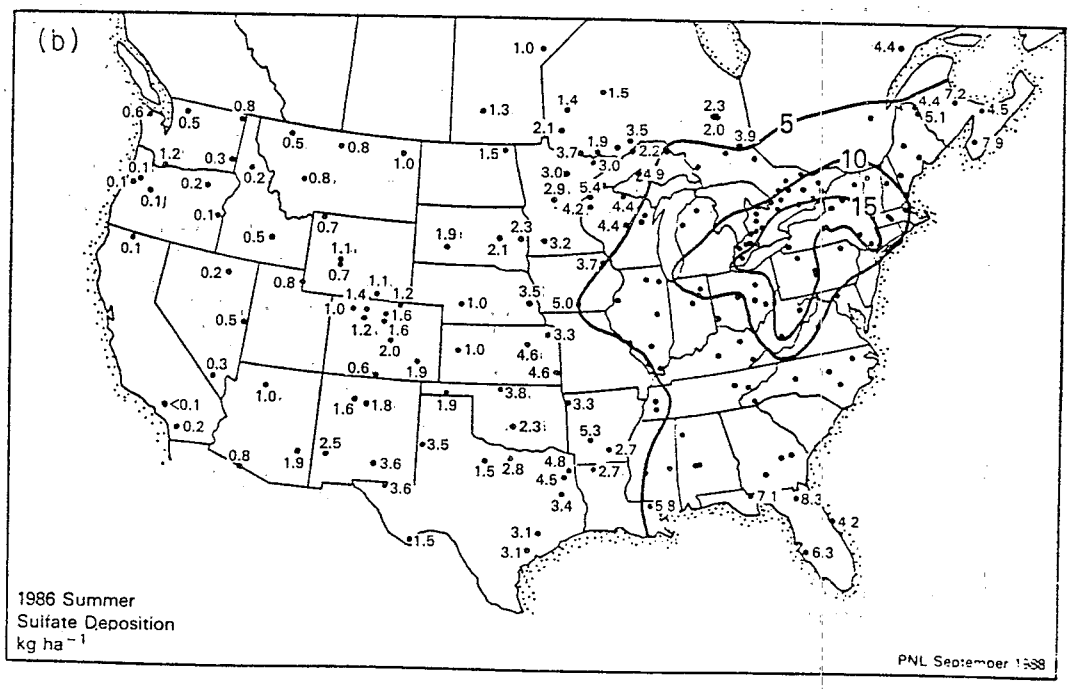
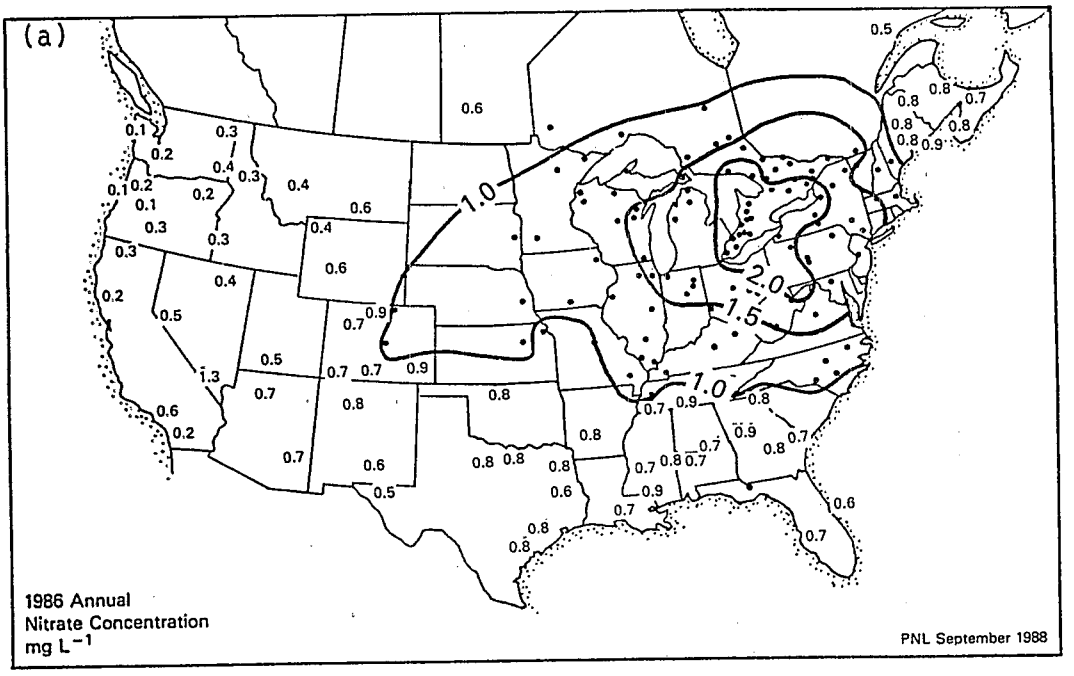


FIGURE 3.7 Summer 1986 spatial distribution of sulfate (a) precipitation-weighted concentration and (b) deposition



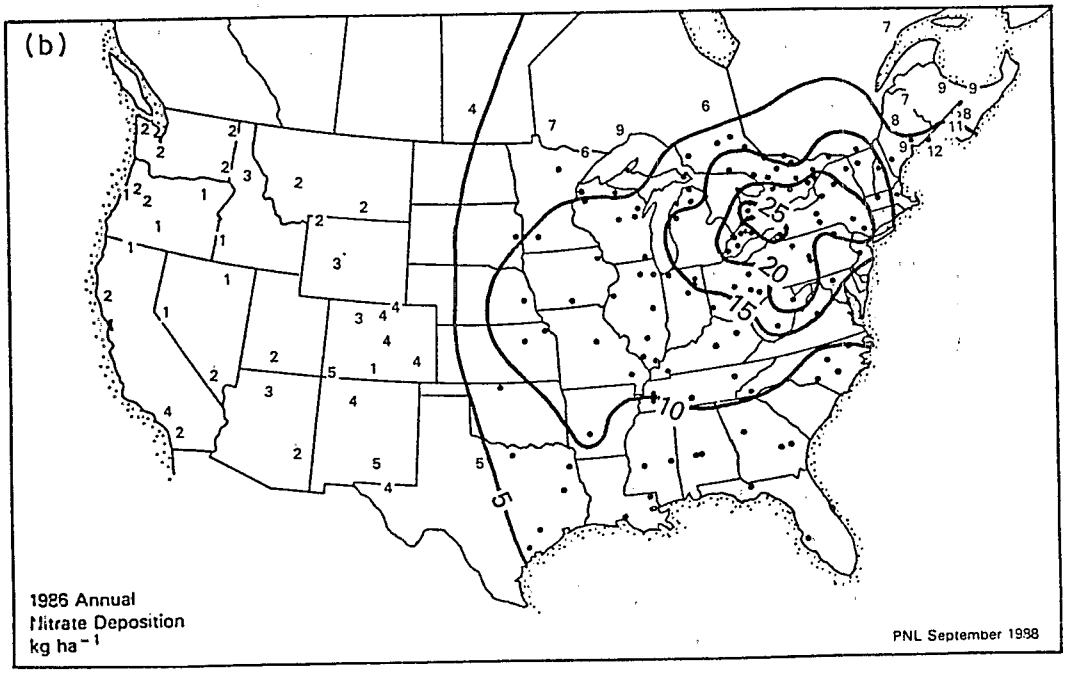
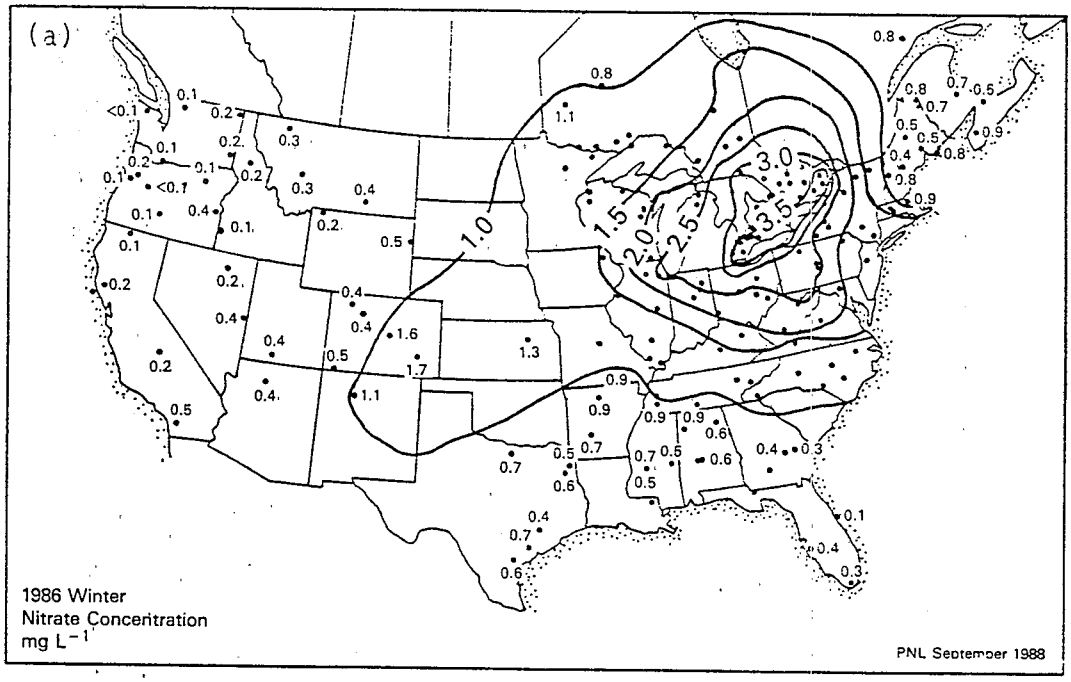


FIGURE 3.8 Annual 1986 spatial distribution of nitrate (a) precipitation-weighted concentration and (b) deposition



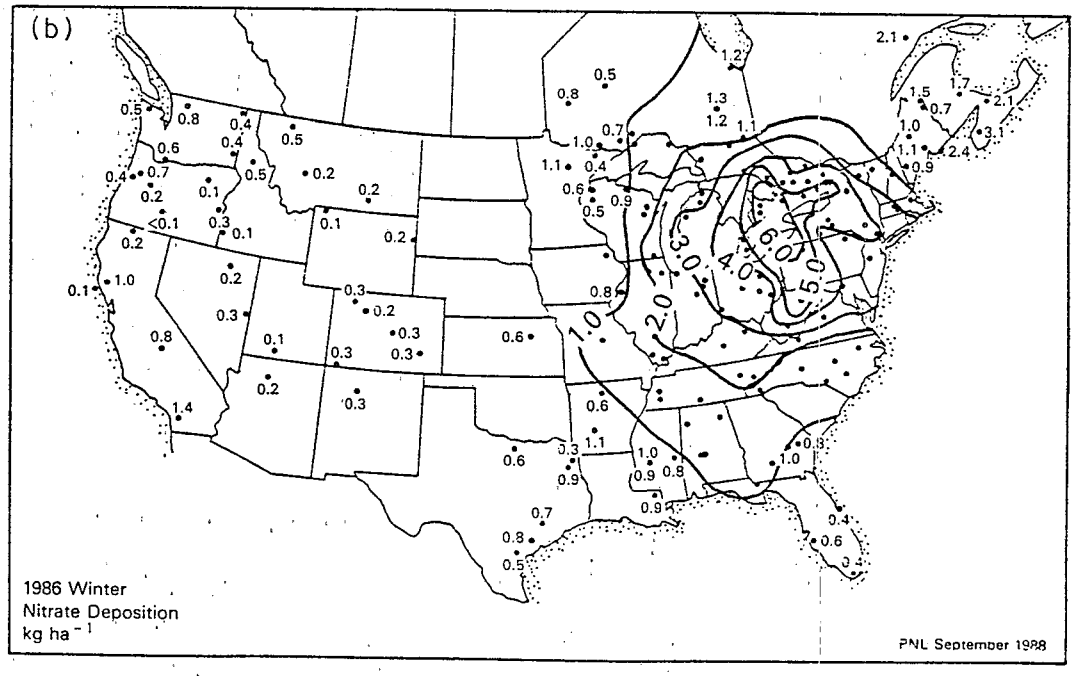
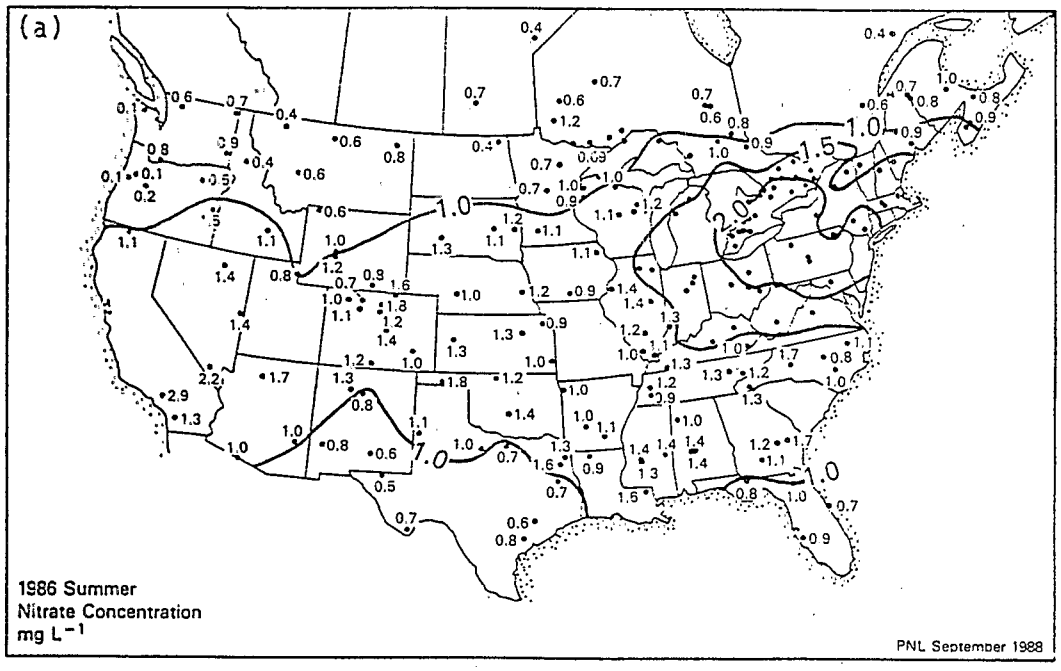


FIGURE 3.9 Winter 1986 spatial distribution of nitrate (a) precipitation-weighted concentration and (b) deposition



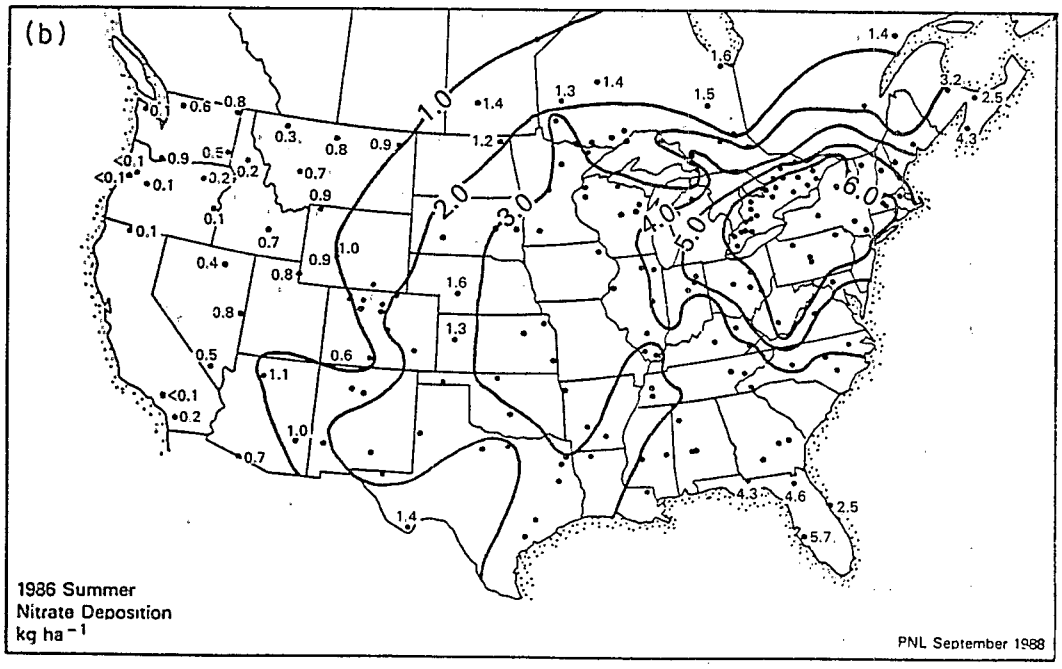
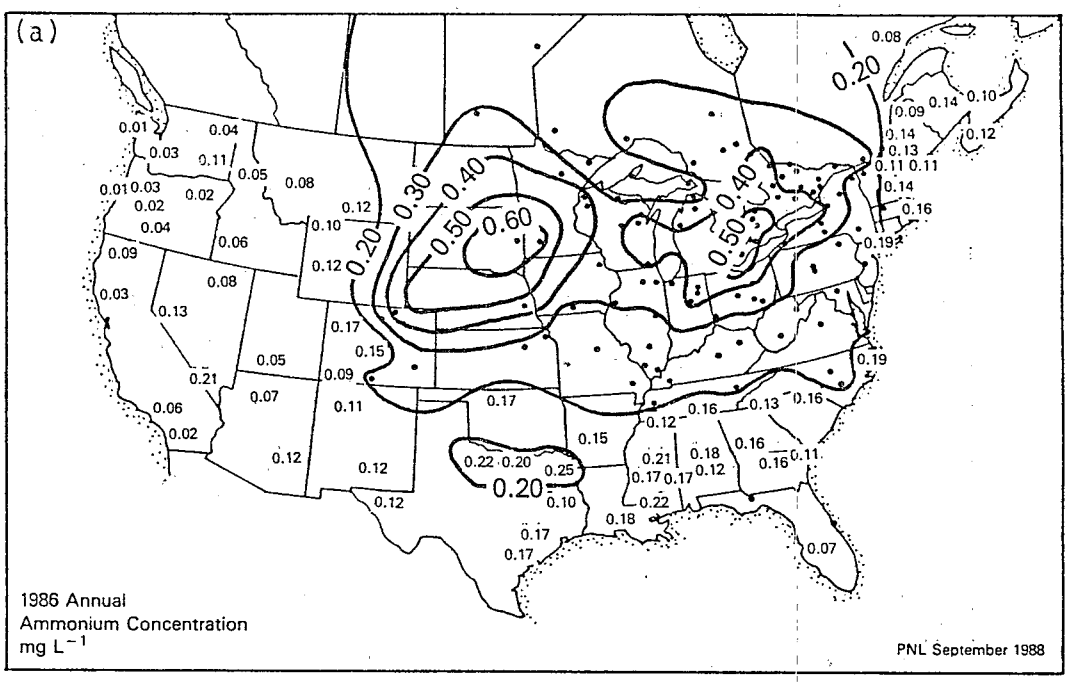


FIGURE 3.10 Summer 1986 spatial distribution of nitrate (a) precipitation-weighted concentration and (b) deposition



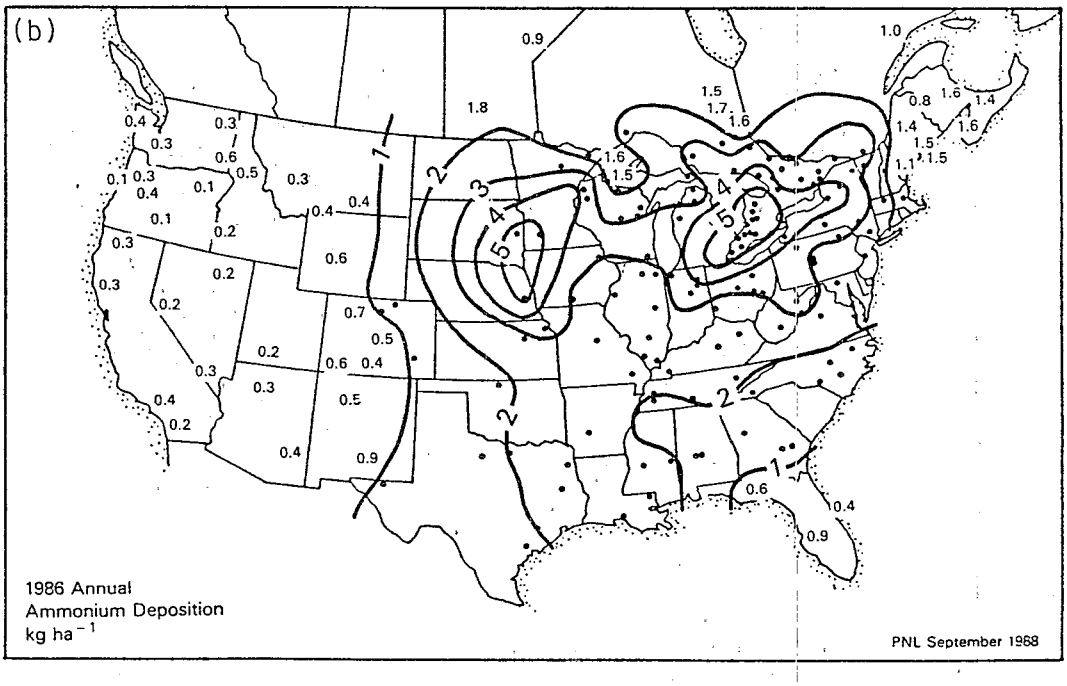
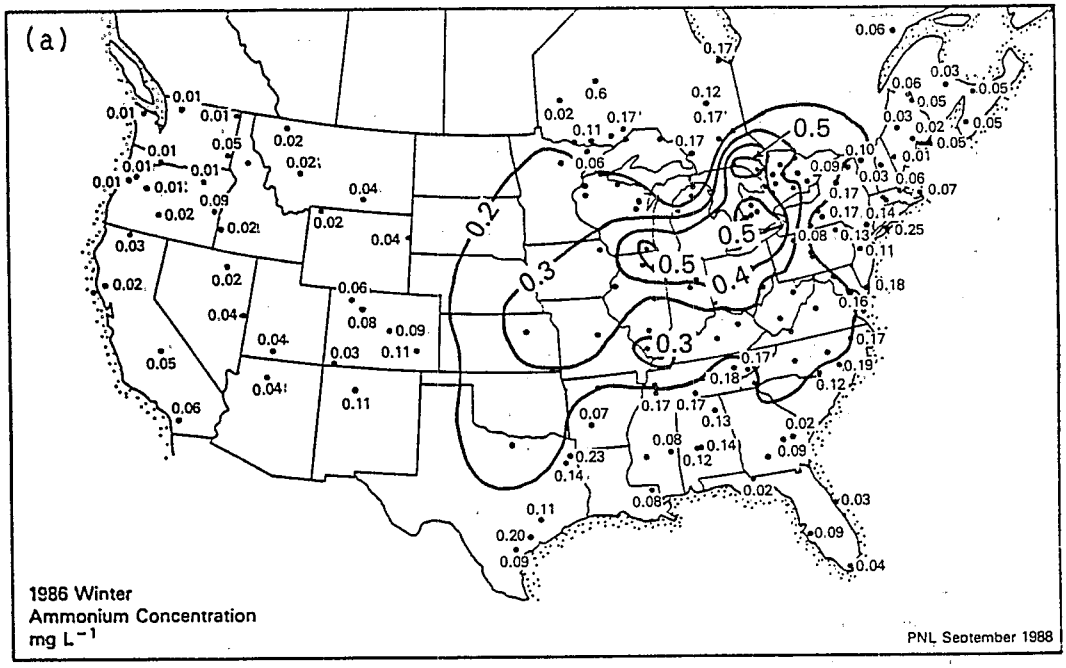


FIGURE 3.11 Annual 1986 spatial distribution of ammonium (a) precipitation-weighted concentration and (b) deposition



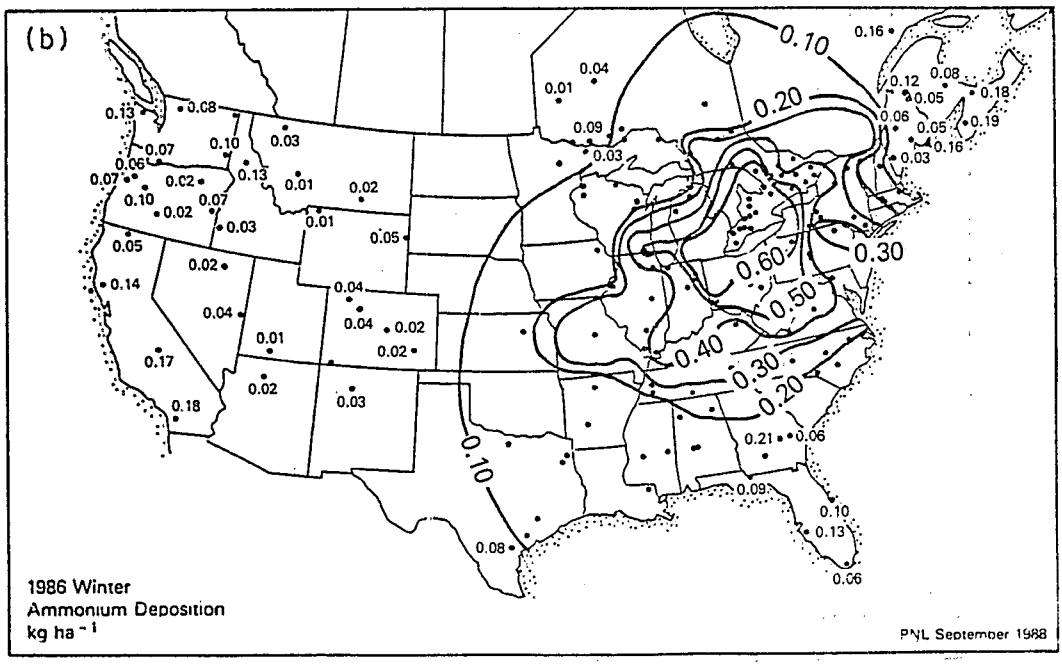
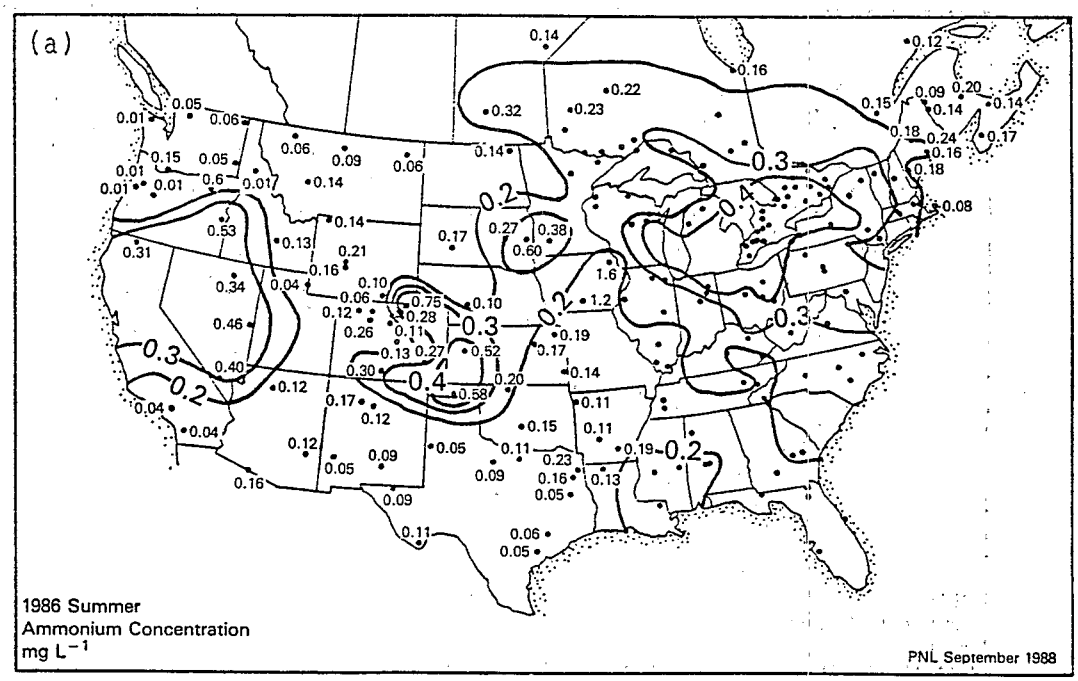


FIGURE 3.12 Winter 1986 spatial distribution of ammonium (a) precipitation-weighted concentration and (b) deposition



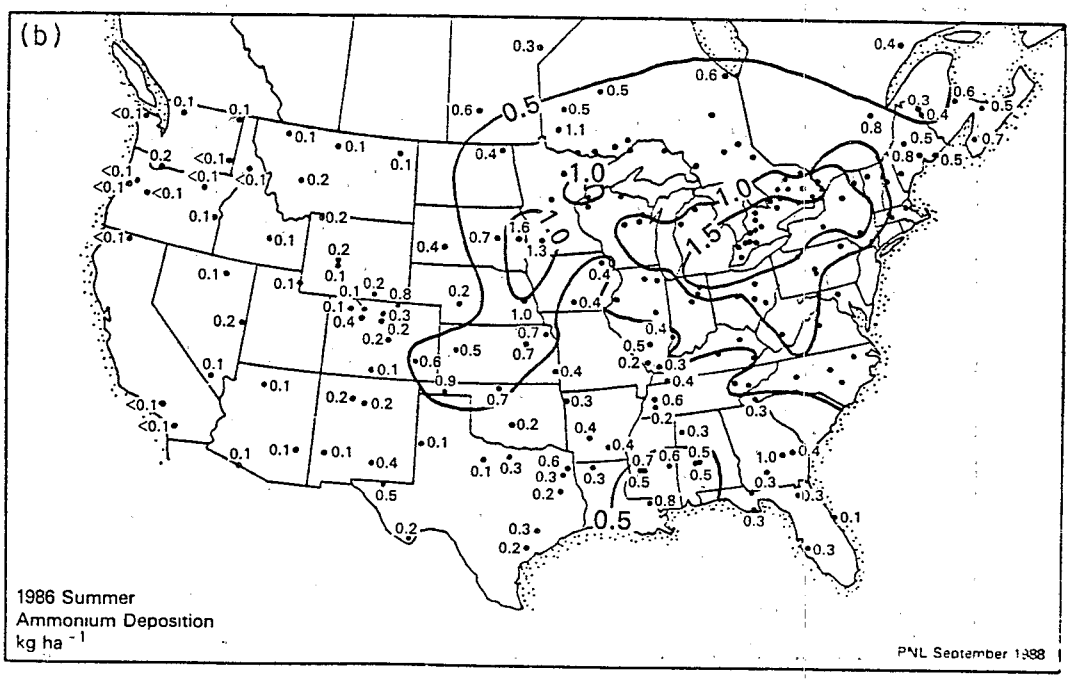
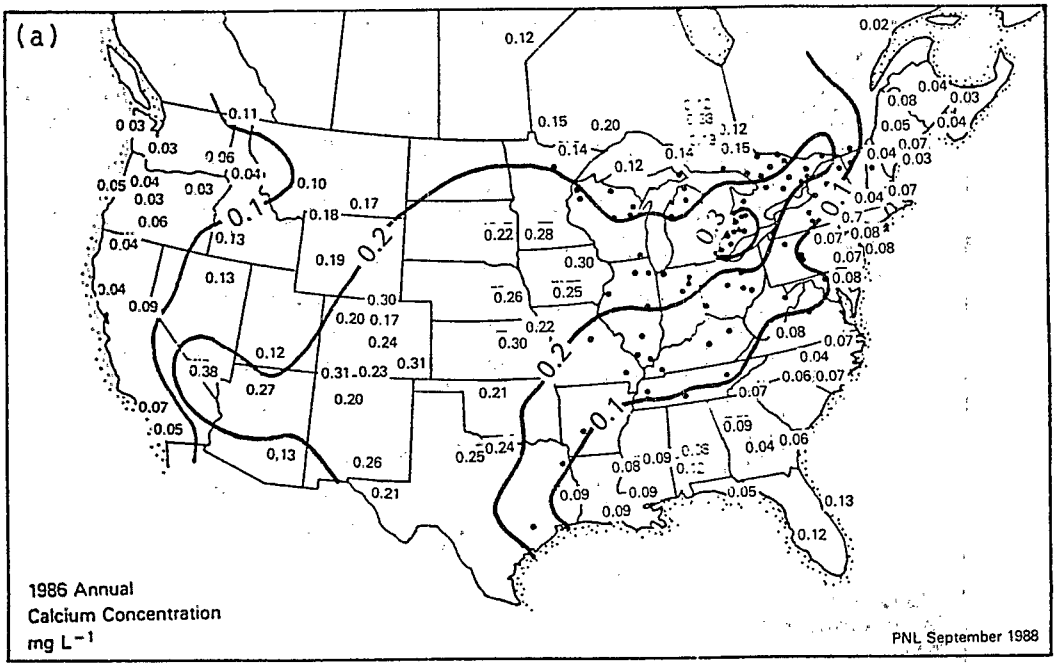


FIGURE 3.13 Summer 1986 spatial distribution of ammonium (a) precipitation-weighted concentration and (b) deposition



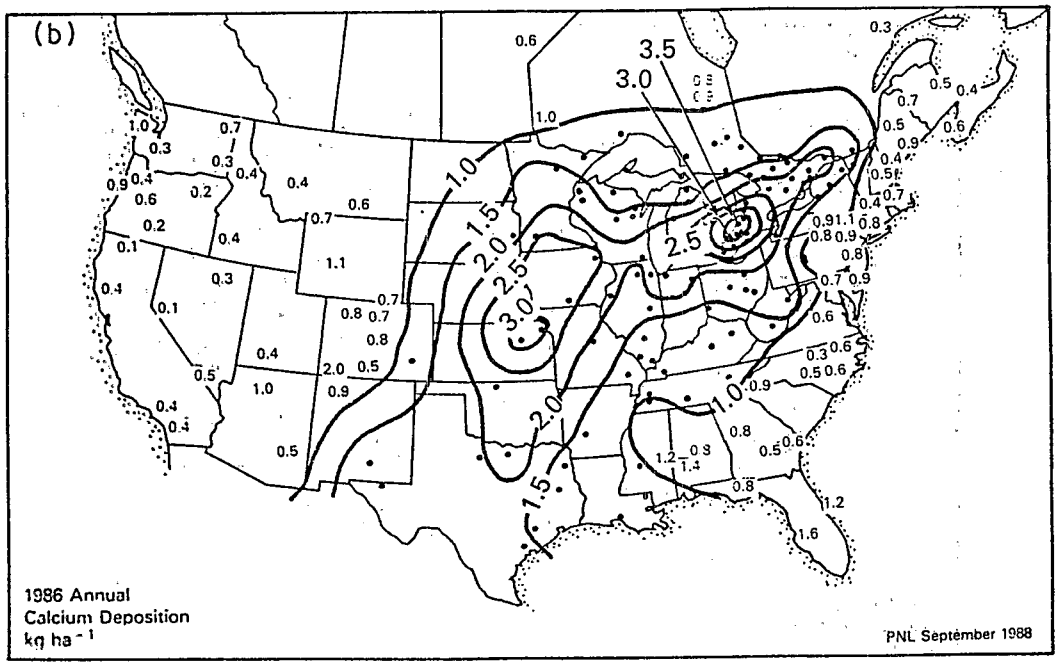
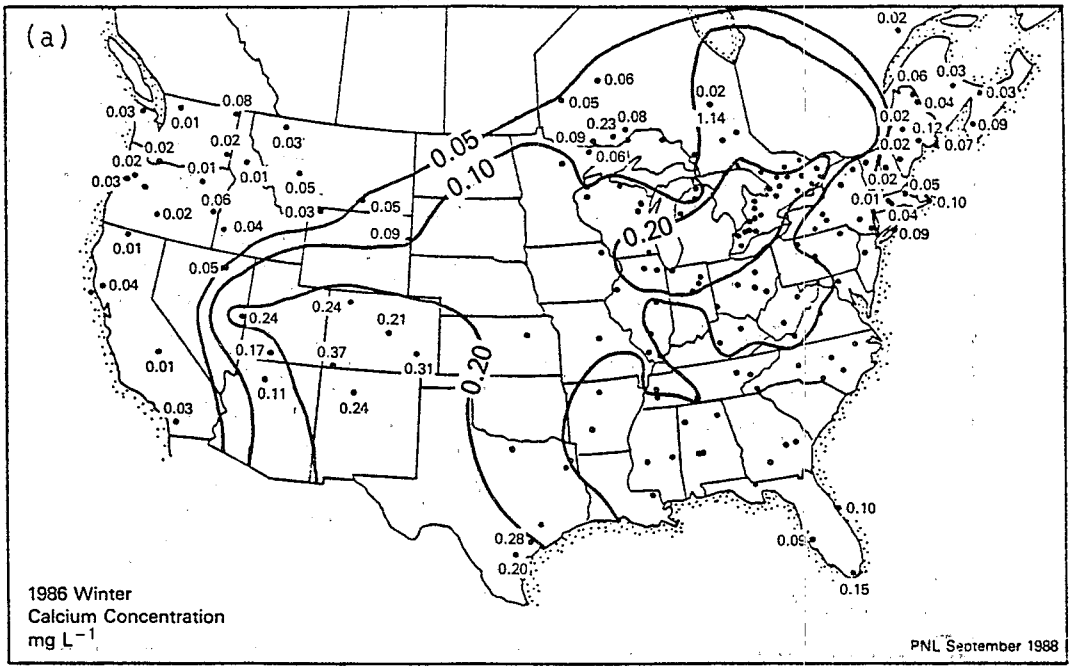


FIGURE 3.14 Annual 1986 spatial distribution of calcium (a) precipitation-weighted concentration and (b) deposition



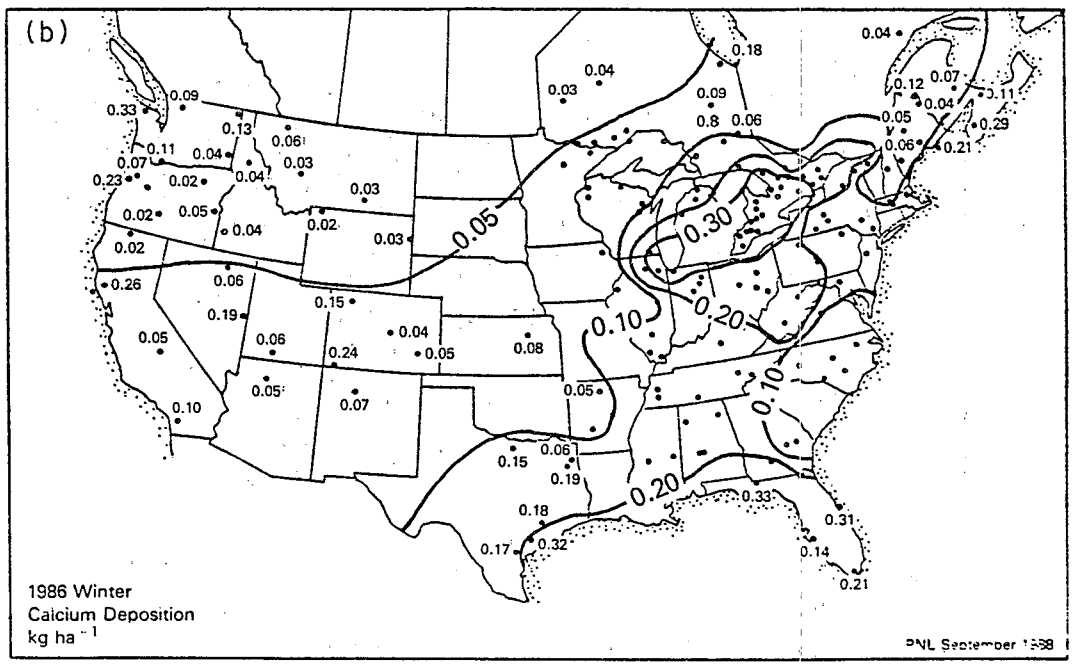
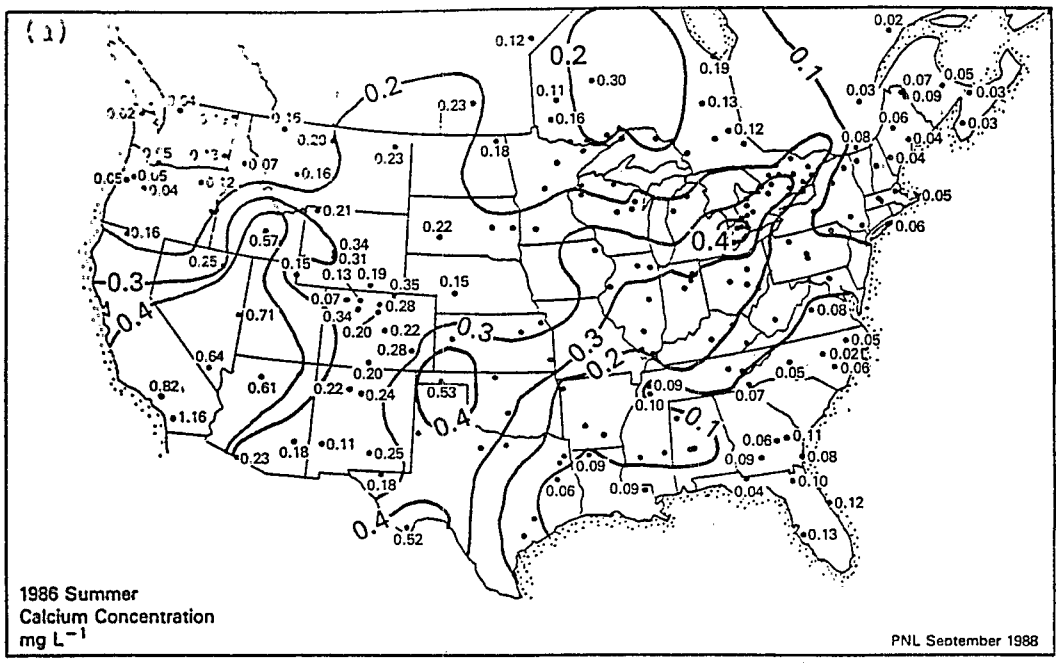


FIGURE 3.15 Winter 1986 spatial distribution of calcium (a) precipitation-weighted concentration and (b) deposition



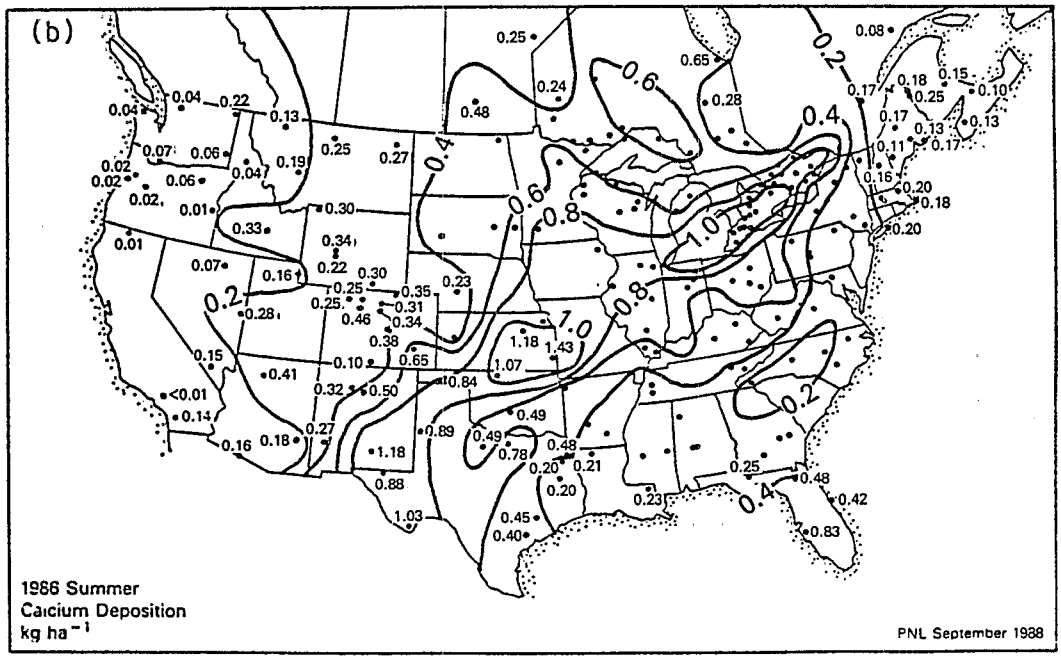


FIGURE 3.16 Summer 1986 spatial distribution of calcium (a) precipitation-weighted concentration and (b) deposition

SECTION 4

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APPENDIX A

GEOGRAPHIC LOCATION OF SITES OPERATING IN 1986

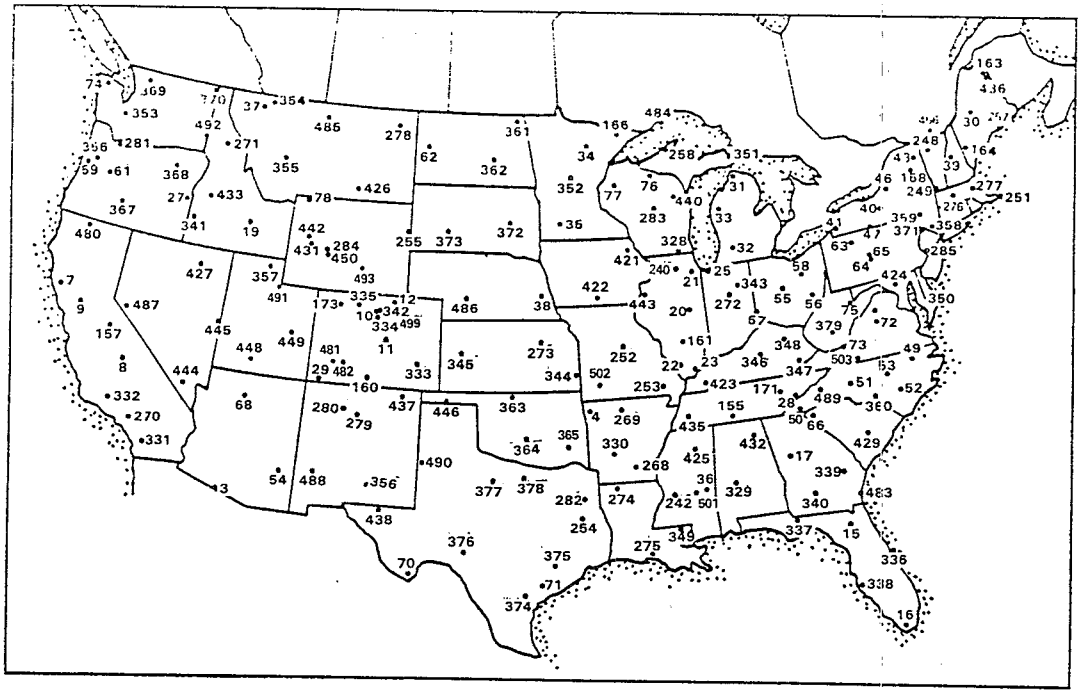

FIGURE A.1. NADP/NTN network sites identified by ADS site code

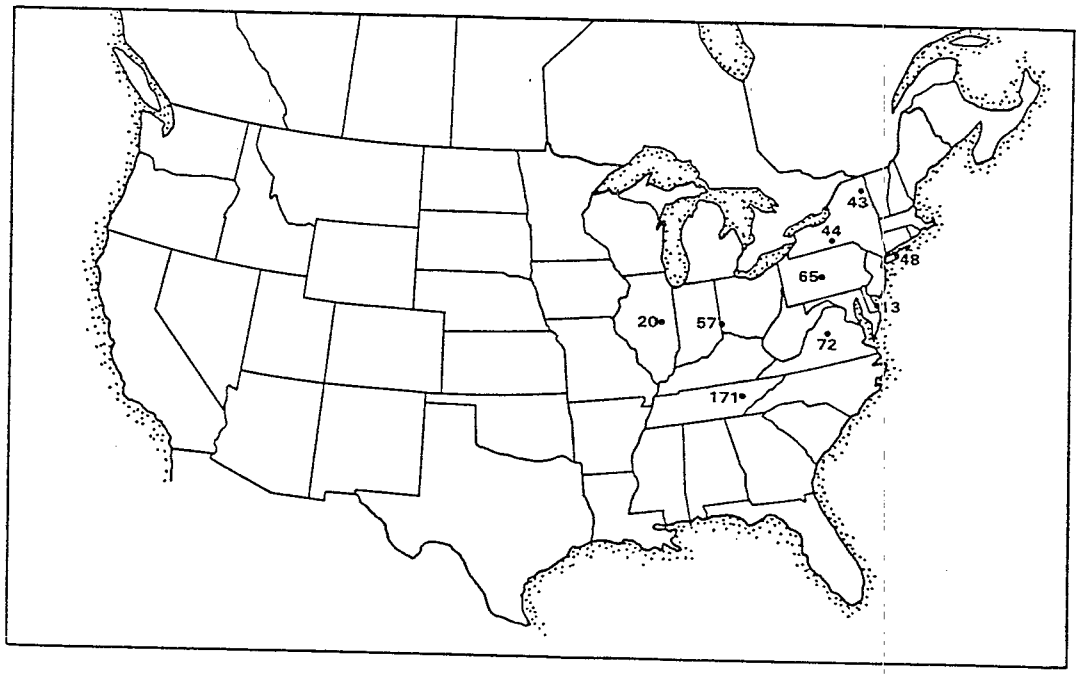

FIGURE A.2. MAP3S/PCN network sites identified by ADS site code

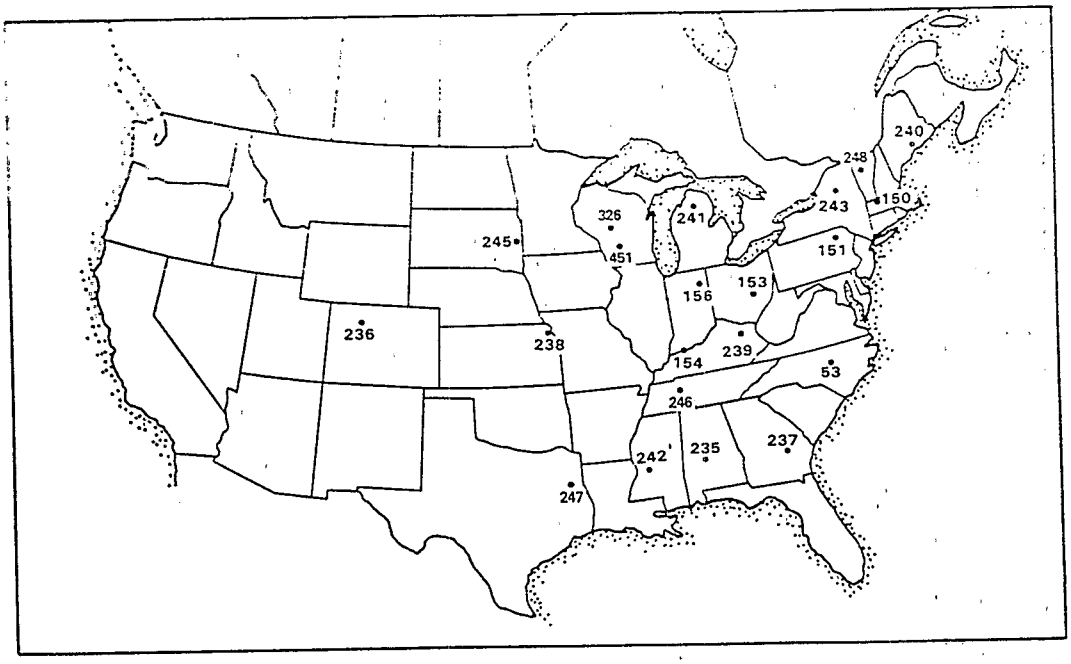

FIGURE A.3. UAPSP network sites identified by ADS site code

T

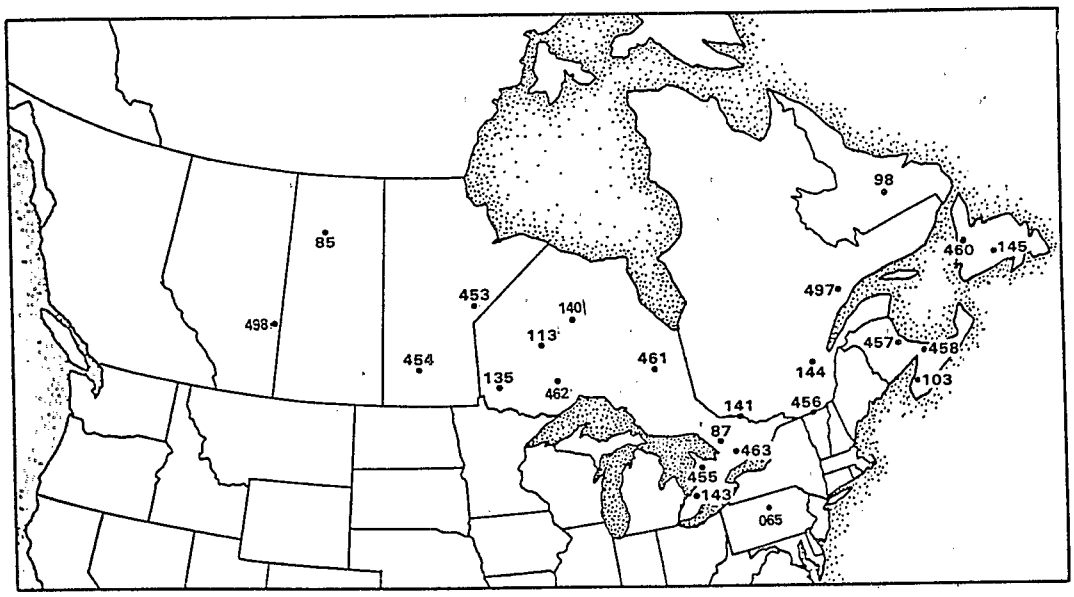

FIGURE A.4. CAPMoN network sites identified by ADS site code

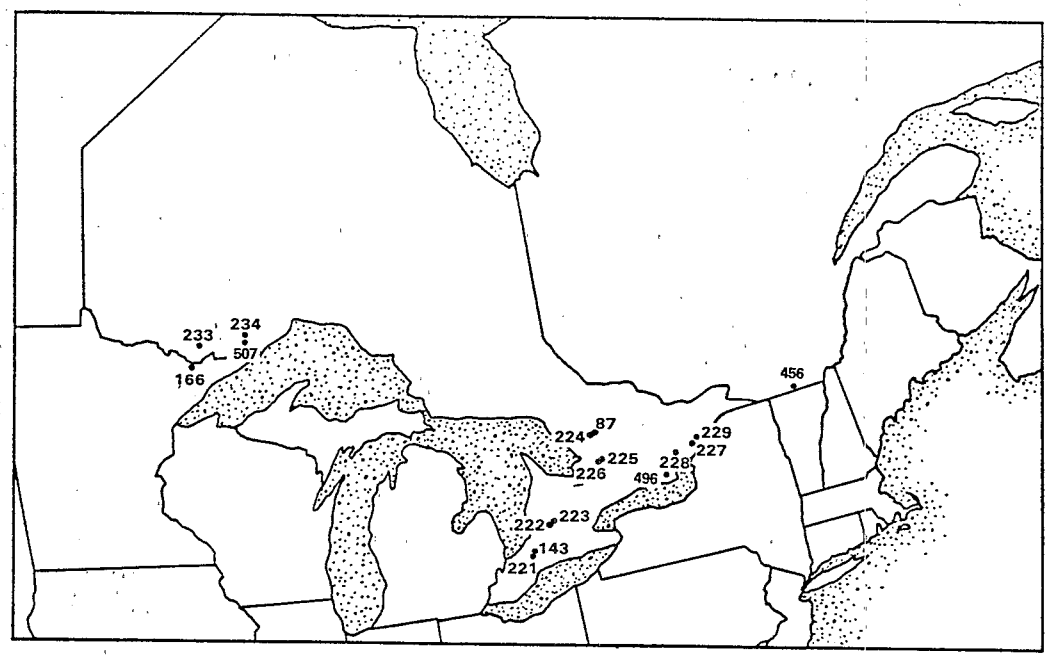

FIGURE A.5. APIOS daily network sites identified by ADS site code

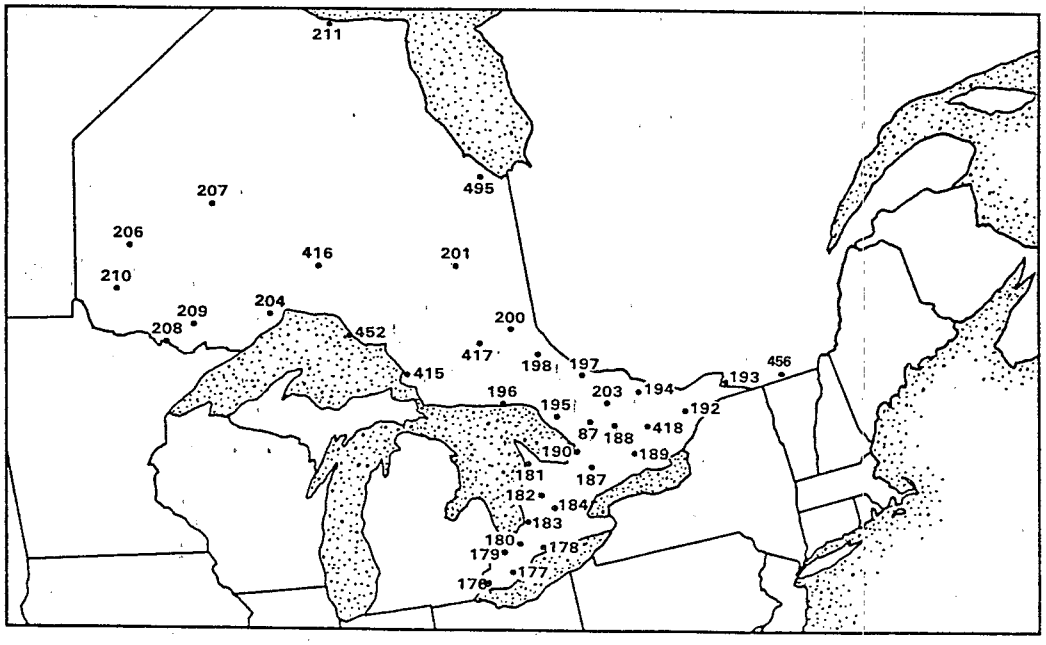

FIGURE A.6. APIOS cumulative network sites identified by ADS site code

APPENDIX B

INVENTORY OF WET DEPOSITION SITES IN ADS
ORDERED BY ADS SITE IDENTIFICATION

Inventory of Wet Deposition Sites in ADS
Ordered by ADS Site Identification

ADS SITE IDENT	NET WORK	NET SITE IDENT	SITE NAME	LATITUDE d m s	LONGITUDE d m s	ELEVATION (meters)	FIRST ACTIVE DATE	LAST ACTIVE DATE
001a	NADP/NTN	020390	Denali Natl Park, Alaska	63 43 27	148 57 55	649	Jun 17, 1980	
002a	NADP/NTN	030180	Tombstone, Arizona	31 42 30	110 03 24	1398	Mar 27, 1979	Sep 1, 1981
003a	NADP/NTN	030620	Organ Pipe Mon., Arizona	31 57 02	112 48 00	506	Apr 15, 1980	
004a	NADP/NTN	042700	Fayetteville, Arkansas	36 06 02	94 10 24	391	May 13, 1980	
006a	NADP/NTN	053460	Bishop, California	37 22 15	118 21 59	1252	Apr 15, 1980	Jun 22, 1982
007a	NADP/NTN	054540	Hopland (Ukiah), California	39 00 17	123 05 05	253	Oct 3, 1979	
008a	NADP/NTN	057550	Sequoia Nat. Park, California	36 34 09	118 46 40	1856	Jul 8, 1980	
009a	NADP/NTN	058840	Davis, California	38 32 07	121 46 30	18	Sep 4, 1978	
010a	NADP/NTN	061910	Rocky Mt. Nat Park, Colorado	40 21 52	105 34 55	2490	May 29, 1980	
011a	NADP/NTN	062120	Manitou, Colorado	39 06 04	105 05 31	2362	Oct 17, 1978	
012a	NADP/NTN	062220	Pawnee, Colorado	40 48 23	104 45 15	1641	May 22, 1979	
013a	MAP3S/PCN	7	Lewes, Delaware	38 46 00	75 00 00	0	Feb 28, 1978	
014a	NADP/NTN	100020	Austin-Cary Forest, Florida	29 45 37	82 11 56	46	Oct 10, 1978	Jul 14, 1981
015a	NADP/NTN	100360	Bradford Forest, Florida	29 58 29	82 11 53	44	Oct 10, 1978	
016a	NADP/NTN	101190	Everglades Nat. Pa, Florida	25 23 40	80 41 45	2	Jun 17, 1980	
017a	NADP/NTN	114140	Georgia Station, Georgia	33 10 40	84 24 22	270	Oct 3, 1978	
018a	NADP/NTN	120080	Mauna Loa, Hawaii	19 32 22	155 34 45	3426	Jun 10, 1980	
019a	NADP/NTN	130340	Crater of the Moon, Idaho	43 27 48	113 33 31	1806	Aug 22, 1980	
020a	NADP/NTN	141160	Bondville, Illinois	40 03 12	88 22 19	212	Feb 27, 1979	
020b	MAP3S/PCN	5	Illinois, Illinois	40 03 12	88 22 19	212	Nov 19, 1977	
020c	NADP/NTN	141161	Bondville intercom, Illinois	40 03 12	88 22 19	212	Sep 20, 1983	Nov 27, 1984
021a	NADP/NTN	141980	Argonne, Illinois	41 42 04	87 59 43	229	Mar 11, 1980	
022a	NADP/NTN	143580	Southern Ill U, Illinois	37 42 36	89 16 08	146	Jul 31, 1979	
023a	NADP/NTN	146340	Dixon Springs, Illinois	37 26 08	88 40 19	161	Jan 30, 1979	
024a	NADP/NTN	141800	Shabbona, Illinois	41 50 29	88 51 04	265	May 26, 1981	
025a	NADP/NTN	153420	Indiana Dunes, Indiana	41 37 57	87 05 16	208	Jul 15, 1980	
026a	NADP/NTN	232570	Isle Royal Park, Michigan	47 54 43	89 09 10	209	Aug 12, 1980	Oct 22, 1984
027a	NADP/NTN	381120	Vines Hill, Oregon	43 53 57	117 25 37	904	Jul 15, 1980	
028a	NADP/NTN	441190	Great Smoky Mts, Tennessee	35 39 52	83 35 25	640	Aug 12, 1980	
029a	NADP/NTN	061530	Mesa Verde, Colorado	37 11 56	108 29 26	2172	Apr 28, 1981	
030a	NADP/NTN	200935	Greenville Station, Maine	45 29 23	69 39 52	322	Nov 20, 1979	
031a	NADP/NTN	230920	Douglas Lake, Michigan	45 33 40	84 40 42	233	Jul 3, 1979	
031b	CANSAP	13 020	Pellston, Michigan	45 33 40	84 40 42	233	Jul 1, 1979	
032a	NADP/NTN	232660	Kellogg, Michigan	42 24 37	85 23 34	288	Jun 26, 1979	
033a	NADP/NTN	235340	Wellston, Michigan	44 13 28	85 49 07	292	Oct 10, 1978	
034a	NADP/NTN	241660	Marcell, Minnesota	47 31 52	93 28 07	431	Jul 6, 1978	
035a	NADP/NTN	242720	Lamberton, Minnesota	44 14 14	95 18 02	343	Jan 2, 1979	
036a	NADP/NTN	251460	Meridian, Mississippi	32 20 04	88 44 42	89	Apr 15, 1980	
037a	NADP/NTN	270570	Glacier Nat'l Park, Montana	48 30 37	113 59 44	968	Jun 3, 1980	
037b	CANSAP	13 010	Glacier Nat Park, Montana	48 30 37	113 59 44	968	Jun 1, 1980	
038a	NADP/NTN	281520	Mead, Nebraska	41 09 11	96 29 34	352	Jul 25, 1978	
039a	NADP/NTN	300240	Hubbard Brook, New Hampshire	43 56 35	71 42 12	250	Jul 25, 1978	
040a	NADP/NTN	330860	Aurora, New York	42 44 02	76 39 35	249	Apr 17, 1979	
041a	NADP/NTN	331000	Chautauqua, New York	42 17 58	79 23 47	488	Jun 10, 1980	
042a	NADP/NTN	331220	Knobit, New York	42 22 41	73 30 10	406	Jan 2, 1980	Aug 6, 1985
043a	MAP3S/PCN	1	Whiteface, New York	44 23 26	73 51 34	610	Oct 10, 1976	
043b	NADP/NTN	332021	Whiteface, New York	44 23 26	73 51 34	610	Jul 3, 1984	
044a	MAP3S/PCN	2	Ithaca, New York	42 24 03	76 39 12	610	Oct 25, 1976	
045a	NADP/NTN	335140	Stilwell Lake, New York	41 21 00	74 02 22	186	Jun 26, 1979	Oct 2, 1984
046a	NADP/NTN	335240	Bennett Bridge, New York	43 31 34	75 56 50	245	Jun 10, 1980	
047a	NADP/NTN	336500	Jasper, New York	42 06 22	77 32 08	634	Feb 19, 1980	
048a	MAP3S/PCN	6	Brookhaven, New York	40 52 00	72 53 00	25	Feb 8, 1978	
049a	NADP/NTN	340320	Lewiston, North Carolina	36 07 40	77 10 30	26	Oct 31, 1978	
050a	NADP/NTN	342500	Coweeta, North Carolina	35 03 38	83 25 50	686	Jul 5, 1978	
051a	NADP/NTN	343460	Piedmont Station, North Carolina	35 41 48	80 37 22	221	Oct 17, 1978	
052a	NADP/NTN	343560	Clinton Station, North Carolina	35 01 26	78 16 45	47	Oct 24, 1978	
053a	NADP/NTN	344160	Finley (A), North Carolina	35 43 43	78 40 52	119	Oct 3, 1978	
053b	NADP/NTN	344161	Finley (B), North Carolina	35 43 43	78 40 52	119	Oct 3, 1978	Apr 1, 1980

Inventory of Wet Deposition Sites in ADS
Ordered by ADS Site Identification

ADS SITE IDENT	NET WORK	NET SITE IDENT	SITE NAME	LATITUDE d m s	LONGITUDE d m s	ELEVATION (meters)	FIRST ACTIVE DATE	LAST ACTIVE DATE
053c	UAPSP	08	Raleigh, North Carolina	35 43 43	78 40 48	128	Aug 1, 1978	
053d	UAPSP	08 smplr 2	Raleigh-2, North Carolina	35 43 43	78 40 48	128	Aug 1, 1978	Jan 1, 1980
054a	NADP/NTN	030360	Oliver Knoll, Arizona	33 04 17	109 51 53	1173	Aug 25, 1981	
055a	NADP/NTN	361760	Delaware, Ohio	40 21 19	83 03 58	285	Oct 3, 1978	
056a	NADP/NTN	364900	Caldwell, Ohio	39 47 34	81 31 52	276	Sep 26, 1978	
057a	MAP3S/PCN	8	Oxford, Ohio	39 31 51	84 43 25	284	Sep 30, 1978	
057b	NADP/NTN	360900	Oxford, Ohio	39 31 51	84 43 25	284	Aug 14, 1984	
058a	NADP/NTN	367160	Wooster, Ohio	40 46 48	81 55 31	315	Sep 26, 1978	
059a	NADP/NTN	380200	Alsea, Oregon	44 23 13	123 37 22	84	Dec 27, 1979	
060a	NADP/NTN	380201	Schmidt Farm, Oregon	44 37 35	123 12 50	69	Dec 26, 1979	Apr 26, 1983
061a	NADP/NTN	381020	H.J. Andrews, Oregon	44 13 23	122 14 32	472	May 13, 1980	
062a	NADP/NTN	350700	Teddy Roosevelt NP, North Dakota	47 36 09	103 15 54	618	May 5, 1981	
063a	NADP/NTN	392940	Kane, Pennsylvania	41 35 52	78 46 04	618	Jul 18, 1978	
064a	NADP/NTN	394200	Leading Ridge, Pennsylvania	40 39 32	77 56 10	282	Apr 25, 1979	
065a	MAP3S/PCN	3	Penn State, Pennsylvania	40 47 18	77 56 47	393	Sep 21, 1976	
065b	NADP/NTN	391520	Penn State, Pennsylvania	40 47 18	77 56 47	393	Jun 7, 1983	
065c	NADP/NTN	391521	Penn State, Pennsylvania	40 47 18	77 56 47	393	Oct 4, 1983	Oct 2, 1984
065d	CAPMoN	9051010	Penn State, Pennsylvania	40 47 00	77 57 00	393	Jan 9, 1986	
066a	NADP/NTN	421880	Clemson, South Carolina	34 37 23	82 43 20	221	Mar 27, 1979	Jun 17, 1986
067a	NADP/NTN	430060	Huron, South Dakota	44 23 02	98 13 14	390	Apr 30, 1980	Sep 20, 1983
068a	NADP/NTN	030370	Grand Canyon, Arizona	36 04 18	112 09 11	2152	Aug 11, 1981	
069a	NADP/NTN	460280	Cedar Mt, Utah	39 10 15	110 37 05	2356	May 11, 1981	Jan 17, 1984
070a	NADP/NTN	450425	Big Bend Nat'l Pk, Texas	29 18 07	103 10 38	1056	Apr 10, 1980	
071a	NADP/NTN	455350	Victoria, Texas	28 50 43	96 55 12	31	Apr 15, 1980	
072a	MAP3S/PCN	4	Virginia, Virginia	38 02 23	78 32 31	172	Dec 11, 1976	
072b	NADP/NTN	480060	Charlottesville, Virginia	38 02 23	78 32 31	172	Oct 2, 1984	
073a	NADP/NTN	481300	Horton's Station, Virginia	37 20 06	80 33 28	1051	Jul 25, 1978	
074a	NADP/NTN	491410	Olympic Nat. Park, Washington	47 51 36	123 55 57	176	May 20, 1980	
075a	NADP/NTN	501860	Parsons, West Virginia	39 05 23	79 39 44	305	Jul 5, 1978	
076a	NADP/NTN	513640	Trout Lake, Wisconsin	46 03 09	89 39 11	501	Jan 22, 1980	
077a	NADP/NTN	513700	Spooner, Wisconsin	45 49 21	91 52 30	331	Jun 3, 1980	
078a	NADP/NTN	520860	Yellowstone, Wyoming	44 55 02	110 25 13	1912	Jun 5, 1980	
079a	CANSAP	07 050	Atikokan, Ontario	48 45 00	91 37 00	393	Apr 30, 1977	Jan 1, 1983
080a	CANSAP	06 030	Bissett, Manitoba	51 02 00	95 40 00	258	May 1, 1977	Jan 1, 1983
081a	CANSAP	09 000	Charlo, New Brunswick	48 00 00	66 20 00	38	May 9, 1977	Jan 1, 1983
082a	CANSAP	08 030	Chibougamau, Quebec	49 49 00	74 25 00	402	Apr 8, 1977	Jun 30, 1982
083a	CANSAP	06 000	Churchill, Manitoba	58 45 00	94 04 00	29	Jun 1, 1977	Oct 31, 1982
084a	CANSAP	04 030	Coronation, Alberta	52 04 00	111 27 00	791	May 1, 1977	
085a	CANSAP	05 000	Cree Lake, Saskatchewan	57 21 00	107 08 00	499	May 1, 1977	Jan 1, 1983
085b	CAPMoN	406JQ60	Cree Lake, Saskatchewan	57 21 00	107 08 00	499	Jul 1, 1982	
086a	CANSAP	06 020	Dauphin, Manitoba	51 06 00	100 03 00	305	Apr 30, 1977	Jan 1, 1983
087a	CANSAP	07 060	Dorset (a), Ontario	45 13 00	78 56 00	319	Jul 13, 1979	
087b	APIOS-D	3011	Dorset (b), Ontario	45 13 23	78 55 49	320	Jul 14, 1980	
087c	APIOS-C	3011	Dorset (c), Ontario	45 13 26	78 55 52	320	May 31, 1980	
087d	CAPMoN	6112068	Dorset, Ontario	45 13 00	78 56 00	320	Nov 1, 1983	Jun 1, 1986
088a	CANSAP	04 010	Edson, Alberta	53 35 00	116 27 00	925	Jan 2, 1974	
089a	CANSAP	01 000	Mould Bay, Northwest Territories	76 14 00	119 20 00	15	Aug 1, 1977	Jan 1, 1983
090a	CANSAP	09 010	Acadia Fes, New Brunswick	46 00 00	66 22 00	61	Nov 1, 1979	
091a	CANSAP	08 000	Fort Chimo, Quebec	58 06 00	68 25 00	36	May 1, 1977	Nov 12, 1982
092a	CANSAP	04 000	Fort McMurray, Alberta	56 39 00	111 13 00	369	Apr 27, 1977	
093a	CANSAP	03 000	Fort Nelson, British Columbia	58 50 00	122 36 00	383	Jun 3, 1977	
094a	CANSAP	01 020	Fort Reliance, Northwest Territories	62 43 00	109 10 00	164	Jul 6, 1977	Apr 1, 1983
095a	CANSAP	01 030	Fort Simpson, Northwest Territories	61 45 00	121 14 00	169	Dec 28, 1973	Aug 1, 1978
096a	CANSAP	03 010	Fort St. John, British Columbia	56 14 00	120 44 00	695	Jun 2, 1977	
097a	CANSAP	12 010	Gander, Newfoundland	48 57 00	54 34 00	151	May 9, 1977	Jan 1, 1983
098a	CANSAP	12 000	Goose, Newfoundland	53 19 00	60 25 00	36	Jul 8, 1977	Jan 1, 1983
098b	CAPMoN	8501896	Goose Bay, Newfoundland	53 19 00	60 21 00	30	Sep 30, 1983	
099a	CANSAP	01 040	Hay River, Northwest Territories	60 50 00	115 47 00	166	Feb 12, 1980	

ADS SITE IDENT	NET WORK	NET SITE IDENT	SITE NAME	LATITUDE d m s	LONGITUDE d m s	ELEVATION (meters)	FIRST ACTIVE DATE	LAST ACTIVE DATE
100a	CANSAP	07 120	Harrow, Ontario	42 02 00	82 54 00	191	Dec 31, 1979	Jan 1, 1983
101a	CANSAP	01 010	Inuvik, Northwest Territories	68 18 00	133 29 00	68	Jun 24, 1977	Jan 1, 1983
102a	CANSAP	07 030	Kapuskasing, Ontario	49 24 00	82 26 00	227	Oct 16, 1979	
103a	CANSAP	10 020	Kejimkujik (a), Nova Scotia	44 25 58	65 12 20	127	Jun 7, 1978	Apr 1, 1984
103b	CAPMoN	8202586	Kejimkujik (b), Nova Scotia	44 26 00	65 12 00	127	May 1, 1979	
103c	NADP/NTN	775048	Kejimkujik (c), Nova Scotia	44 25 58	65 12 20	152	May 12, 1981	Apr 3, 1984
103d	CAPMoN	8202593	Kejimkujik 2, Nova Scotia	44 26 00	65 12 00	127	Jan 4, 1986	
104a	CANSAP	03 070	Kelowna, British Columbia	49 58 00	119 23 00	430	Apr 30, 1977	
105a	CANSAP	05 010	Kindersley, Saskatchewan	51 28 00	109 10 00	683	May 1, 1977	
106a	CANSAP	07 070	Kingston, Ontario	44 13 00	76 36 00	92	May 1, 1977	Jan 1, 1983
107a	CANSAP	04 040	Lethbridge (a), Alberta	49 38 13	112 47 16	913	Jul 31, 1977	
107b	NADP/NTN	775070	Lethbridge (b), Alberta	49 38 13	112 47 16	913	Apr 28, 1981	Apr 3, 1984
108a	CANSAP	08 050	Maniwaki, Quebec	46 23 00	75 58 00	170	May 10, 1975	
109a	CANSAP	07 010	Moosonee, Ontario	51 16 00	80 39 00	10	Jun 1, 1977	Jan 1, 1983
110a	CANSAP	07 090	Mount Forest (a), Ontario	43 59 29	80 44 46	415	Jul 17, 1973	
110b	NADP/NTN	776000	Mount Forest (b), Ontario	43 59 29	80 44 46	410	May 5, 1981	Mar 20, 1984
111a	CANSAP	08 010	Nitchequon, Quebec	53 12 00	70 54 00	536	Apr 1, 1977	Jan 1, 1983
111b	CAPMoN	7095478	Nitchequon, Quebec	53 12 00	70 54 00	550	Aug 1, 1983	Nov 1, 1985
112a	CANSAP	07 080	Peterborough, Ontario	44 14 00	78 21 00	191	Jun 11, 1977	Jan 1, 1983
113a	CANSAP	07 020	Pickle Lake, Ontario	51 28 00	90 12 00	369	Feb 1, 1977	Jan 1, 1983
113b	CAPMoN	6016523	Pickle Lake, Ontario	51 28 00	90 12 00	370	Sep 1, 1983	Mar 31, 1986
114a	CANSAP	03 040	Port Hardy, British Columbia	50 41 00	127 22 00	22	May 10, 1977	
115a	CANSAP	03 030	Prince George, British Columbia	53 53 00	122 40 00	691	Apr 6, 1977	
116a	CANSAP	08 040	Quebec City, Quebec	46 48 00	71 24 00	73	May 31, 1977	Jan 1, 1983
117a	CANSAP	10 010	Sable Island, Nova Scotia	43 56 00	60 01 00	4	Mar 4, 1975	Jan 1, 1983
118a	CANSAP	08 060	St. Hubert, Quebec	45 31 00	73 25 00	27	May 31, 1977	Nov 30, 1982
119a	CANSAP	09 020	St. John, New Brunswick	45 19 00	65 53 00	109	May 9, 1977	Jan 1, 1983
120a	CANSAP	08 020	Sept Isles, Quebec	50 13 00	66 15 00	55	Apr 1, 1977	
121a	CANSAP	10 030	Shelburne, Nova Scotia	43 43 00	65 15 00	30	Jan 1, 1976	Jan 1, 1983
122a	CANSAP	07 110	Simcoe, Ontario	42 51 00	80 16 00	241	Jun 1, 1977	Jan 1, 1983
123a	CANSAP	12 020	Stephenville, Newfoundland	48 32 00	58 33 00	26	May 1, 1977	
124a	CANSAP	03 020	Terrace, British Columbia	54 28 00	128 35 00	217	Apr 14, 1977	
125a	CANSAP	06 010	The Pas, Manitoba	53 58 00	101 06 00	273	May 11, 1977	Jan 1, 1983
126a	CANSAP	07 000	Trout Lake, Ontario	53 50 00	89 52 00	220	May 9, 1977	Jan 1, 1983
127a	CANSAP	10 000	Truro, Nova Scotia	45 22 00	63 16 00	40	May 9, 1977	
128a	CANSAP	03 060	Vancouver, British Columbia	49 11 00	123 10 00	2	Aug 1, 1977	
129a	CANSAP	07 130	Wawa, Ontario	47 58 00	84 47 00	287	May 11, 1977	Sep 30, 1979
130a	CANSAP	02 000	Whitehorse, Yukon Territory	60 43 00	135 04 00	703	Jul 1, 1977	
131a	CANSAP	07 150	Windsor, Ontario	42 16 00	82 58 00	190	Jun 1, 1977	Nov 30, 1979
132a	CANSAP	05 020	Wynyard, Saskatchewan	51 46 00	104 12 00	561	Mar 1, 1974	
133a	CANSAP	03 050	Revelstoke, British Columbia	50 58 00	118 11 00	443	Sep 7, 1979	
134a	CANSAP	04 020	Rocky Mtn House, Alberta	52 23 00	114 55 00	988	May 10, 1977	
135a	CANSAP	07 023	ELA (a), Ontario	49 40 00	93 43 00	368	Aug 1, 1979	
135b	CAPMoN	603KKNB	ELA (b), Ontario	49 40 00	93 43 00	369	Nov 1, 1978	
140a	CAPMoN	6050179	Algoma, Ontario	47 06 00	84 06 00	411	Sep 1, 1980	
141a	CAPMoN	6101328	Chalk River, Ontario	46 04 00	77 24 00	122	Nov 1, 1978	
142a	APN	6134608	Long Point, Ontario	42 36 00	80 30 00	175	Nov 1, 1978	Nov 30, 1982
143a	CAPMoN	6144585	Longwoods (a), Ontario	42 53 00	81 29 00	278	Dec 1, 1982	
143b	APIOS-D	1011	Longwoods (b), Ontario	42 53 02	81 28 50	239	Jul 14, 1980	
144a	CAPMoN	7045216	Montmorency, Quebec	47 19 00	71 09 00	640	Dec 1, 1980	
145a	CAPMoN	8400405	Bay d'Espoir, Newfoundland	47 59 00	55 49 00	190	Nov 1, 1981	
149a	UAPSP	01	Montague, Massachusetts	42 32 00	72 32 08	73	Aug 1, 1978	Jul 31, 1980
149b	UAPSP	01 smplr 2	Montague-2, Massachusetts	42 32 00	72 32 08	73	Aug 1, 1978	Dec 31, 1979
150a	UAPSP	01	Turners Falls, Massachusetts	42 35 50	72 32 55	98	Aug 1, 1980	
151a	UAPSP	02	Scranton, Pennsylvania	41 34 30	75 59 40	335	Aug 1, 1978	
151b	UAPSP	02 smplr 2	Scranton-2, Pennsylvania	41 34 30	75 59 40	335	Aug 1, 1978	Dec 31, 1979
152a	UAPSP	03	Indian River, Delaware	38 34 50	75 14 45	6	Aug 1, 1978	Jun 30, 1980
152b	UAPSP	03 smplr 2	Indian River-2, Delaware	38 34 50	75 14 45	6	Aug 1, 1978	Dec 31, 1979

ADS SITE IDENT	NET WORK	NET SITE IDENT	SITE NAME	LATITUDE d m s	LONGITUDE d m s	ELEVATION (meters)	FIRST ACTIVE DATE	LAST ACTIVE DATE
153a	UAPSP	04	Zanesville, Ohio	39 59 02	82 01 05	250	Aug 1, 1978	
153b	UAPSP	04 smplr 2	Zanesville-2, Ohio	39 59 02	82 01 05	250	Aug 1, 1978	Dec 31, 1979
154a	UAPSP	05	Rockport, Indiana	37 52 50	87 07 47	131	Aug 1, 1978	
154b	UAPSP	05 smplr 2	Rockport-2, Indiana	37 52 50	87 07 47	131	Aug 1, 1978	Dec 31, 1979
155a	UAPSP	06	Giles County, Tennessee	35 17 05	86 54 11	244	Aug 1, 1978	Jun 30, 1980
155b	UAPSP	06 smplr 2	Giles County-2, Tennessee	35 17 05	86 54 11	244	Aug 1, 1978	Jan 1, 1980
155c	TVA	GILES CNTY	GILES COUNTY, Tennessee	35 17 05	86 54 11	244	May 3, 1978	Nov 27, 1984
155d	NADP/NTN	441140	Giles County, Tennessee	35 17 05	86 54 12	57	Oct 2, 1984	
156a	UAPSP	07	Fort Wayne, Indiana	41 02 39	85 19 08	244	Aug 1, 1978	
156b	UAPSP	07 smplr 2	Fort Wayne-2, Indiana	41 02 39	85 19 08	244	Aug 1, 1978	Dec 31, 1979
157a	NADP/NTN	058850	Yosemite, California	37 47 49	119 51 30	1408	Dec 8, 1981	
158a	UAPSP	09	Lewisburg, West Virginia	37 50 50	80 25 00	701	Aug 1, 1978	Dec 31, 1980
158b	UAPSP	09 smplr 2	Lewisburg-2, West Virginia	37 50 50	80 25 00	701	Aug 1, 1978	Dec 31, 1979
159a	NADP/NTN	058500	Channel Islands, California	34 00 57	119 21 43	49	Jul 22, 1980	Feb 19, 1982
160a	NADP/NTN	060060	Alamosa, Colorado	37 26 29	105 51 55	2298	Apr 22, 1980	
161a	NADP/NTN	144740	Salem, Illinois	38 38 36	88 58 01	173	Apr 15, 1980	
162a	NADP/NTN	200010	Acadia < 11/81, Maine	44 24 30	68 14 42	37	Nov 18, 1980	Nov 3, 1981
163a	NADP/NTN	200045	Caribou (a), Maine	46 52 08	68 00 55	191	Apr 14, 1980	
163b	CANSAP	13 000	Caribou (b), Maine	46 52 08	68 00 55	191	Apr 1, 1980	
164a	NADP/NTN	200277	Bridgton, Maine	44 06 27	70 43 44	222	Sep 30, 1980	
165a	NADP/NTN	232240	Houghton, Michigan	47 13 33	88 37 50	193	Oct 26, 1980	Feb 15, 1983
166a	NADP/NTN	241840	Fernberg, Minnesota	47 56 45	91 29 43	524	Nov 18, 1980	
166b	APIOS-D	6051	Fernberg, Minnesota	47 56 51	91 29 26	506	Oct 1, 1981	
167a	NADP/NTN	312980	Princeton, New Jersey	40 20 44	74 37 01	37	Aug 6, 1980	Jul 7, 1981
168a	NADP/NTN	332020	Huntington, New York	43 58 19	74 13 25	500	Oct 31, 1978	
169a	NADP/NTN	343310	R Triangle Park, North Carolina	35 53 47	78 51 38	94	Apr 15, 1980	Mar 1, 1983
170a	NADP/NTN	380840	Lost Creek Dam, Oregon	42 40 04	122 40 59	475	Oct 21, 1980	Dec 6, 1983
171a	NADP/NTN	440040	Walker Branch, Tennessee	35 57 41	84 17 14	341	Mar 11, 1980	
171b	MAP3S/PCN	9	Oak Ridge, Tennessee	35 57 41	84 17 14	341	Jan 6, 1981	
172a	NADP/NTN	530190	American Samoa, American Samoa	-14 15 08	170 33 48	73	May 20, 1980	
173a	NADP/NTN	061560	Sand Spring, Colorado	40 30 27	107 42 07	1998	Mar 20, 1979	
174a	NADP/NTN	341180	R Triangle Inst, North Carolina	35 54 09	78 52 12	99	Oct 14, 1980	Jan 4, 1983
175a	NADP/NTN	381780	Pendleton, Oregon	45 41 23	118 50 16	542	Apr 15, 1980	Jun 15, 1982
176a	APIOS-C	1041	Colchester, Ontario	41 59 15	82 55 41	183	Sep 2, 1980	
177a	APIOS-C	1051	Merlin, Ontario	42 14 47	82 13 30	191	Sep 2, 1980	
178a	APIOS-C	1061	Port Stanley, Ontario	42 40 22	81 09 55	213	Sep 2, 1980	
179a	APIOS-C	1071	Wilkesport, Ontario	42 42 11	82 21 13	183	Sep 3, 1980	
180a	APIOS-C	1081	Alvinston, Ontario	42 49 36	81 50 04	221	Sep 5, 1980	
181a	APIOS-C	1091	Shallow Lake, Ontario	44 34 54	81 05 24	229	Sep 30, 1980	
182a	APIOS-C	1101	Palmerston, Ontario	43 48 19	80 54 12	389	Sep 2, 1980	
183a	APIOS-C	1191	Huron Park, Ontario	43 17 28	81 30 03	250	Oct 2, 1981	
184a	APIOS-C	2021	Waterloo, Ontario	43 28 39	80 35 09	343	Sep 1, 1980	
186a	APIOS-C	3051	Milton, Ontario	43 31 05	79 55 54	221	Sep 2, 1980	Mar 28, 1984
187a	APIOS-C	3061	Uxbridge, Ontario	44 12 46	79 12 38	244	Sep 2, 1980	
188a	APIOS-C	3071	Wilberforce, Ontario	45 00 54	78 12 58	396	Sep 2, 1980	
189a	APIOS-C	3081	Campbellford, Ontario	44 17 28	77 47 33	175	Sep 4, 1980	
190a	APIOS-C	3101	Coldwater, Ontario	44 37 31	79 32 08	280	Aug 31, 1981	
191a	APIOS-C	4051	Kaladar, Ontario	44 41 31	77 09 18	244	Sep 2, 1980	Nov 10, 1982
192a	APIOS-C	4061	Smith's Falls, Ontario	44 56 41	75 57 48	122	Sep 3, 1980	
193a	APIOS-C	4071	Dalhousie Mills, Ontario	45 19 00	74 28 13	69	Sep 3, 1980	
194a	APIOS-C	4081	Golden Lake, Ontario	45 36 48	77 12 03	160	Sep 2, 1980	
195a	APIOS-C	5011	McKellar, Ontario	45 30 57	79 55 19	244	Aug 25, 1980	
196a	APIOS-C	5021	Killarney, Ontario	45 59 26	81 29 18	183	May 28, 1980	
197a	APIOS-C	5031	Mattawa, Ontario	46 16 45	78 49 19	198	Aug 22, 1980	
198a	APIOS-C	5041	Bear Island, Ontario	46 58 22	80 04 40	305	May 29, 1980	
199a	APIOS-C	5051	Ramsey, Ontario	47 26 33	82 20 14	427	May 29, 1980	Jul 25, 1983
200a	APIOS-C	5061	Gowganda, Ontario	47 39 04	80 46 32	343	Jul 3, 1980	
201a	APIOS-C	5071	Moonbeam, Ontario	49 19 16	82 08 46	244	Sep 2, 1980	

ADS SITE IDENT	NET WORK	NET SITE IDENT	SITE NAME	LATITUDE d m s	LONGITUDE d m s	ELEVATION (meters)	FIRST ACTIVE DATE	LAST ACTIVE DATE
202a	APIOS-C	5081	Attawapiskat, Ontario	52 56 00	82 24 00	9	Sep 2, 1980	Feb 29, 1984
203a	APIOS-C	5091	Whitney, Ontario	45 32 21	78 15 35	412	Sep 2, 1980	
204a	APIOS-C	6011	Dorion, Ontario	48 50 33	88 36 45	244	Sep 2, 1980	
205a	APIOS-C	6021	Nakina, Ontario	50 10 38	86 42 40	320	Sep 2, 1980	Jul 20, 1983
206a	APIOS-C	6031	Ear Falls, Ontario	50 38 31	93 13 13	350	Sep 2, 1980	
207a	APIOS-C	6041	Pickle Lake, Ontario	51 27 41	90 12 04	360	Jul 26, 1980	
208a	APIOS-C	6061	Lac Le Croix (a), Ontario	48 21 14	92 12 32	368	Dec 1, 1981	
208b	APIOS-D	6061	Lac Le Croix (b), Ontario	48 21 14	92 12 32	368	Sep 23, 1981	Mar 16, 1984
209a	APIOS-C	6071	Quetico Centre, Ontario	48 44 24	91 12 08	420	Nov 30, 1981	
210a	APIOS-C	6091	Expt. Lake Area, Ontario	49 39 22	93 43 28	123	Oct 6, 1981	
211a	APIOS-C	6101	Winisk, Ontario	55 12 00	85 08 00	9	Jul 20, 1982	
221a	APIOS-D	1021	Melbourne, Ontario	42 47 15	81 33 23	213	Nov 3, 1980	
222a	APIOS-D	1031	North Easthope, Ontario	43 24 21	80 53 35	375	Nov 1, 1980	
223a	APIOS-D	2011	Wellesley, Ontario	43 28 13	80 45 35	344	Jan 27, 1981	
224a	APIOS-D	3021	Nithgrove, Ontario	45 12 01	79 04 14	335	Jan 26, 1981	
225a	APIOS-D	3031	Balsam Lake, Ontario	44 37 35	78 51 22	259	Nov 21, 1980	
226a	APIOS-D	3041	Raven Lake, Ontario	44 36 40	78 54 43	274	Feb 1, 1981	
227a	APIOS-D	4011	Charleston Lake, Ontario	44 29 54	76 02 30	92	Jan 25, 1981	
228a	APIOS-D	4021	Railton, Ontario	44 22 34	76 35 33	137	Jul 14, 1980	
229a	APIOS-D	4031	Graham Lake, Ontario	44 35 22	75 51 44	130	Oct 25, 1980	Nov 9, 1986
230a	APIOS-D	4041	Whitman Creek, Ontario	44 29 07	76 49 19	137	Oct 24, 1980	Oct 30, 1984
233a	APIOS-D	6071	Quetico Centre, Ontario	48 24 44	91 12 08	420	Oct 16, 1981	
234a	APIOS-D	6081	Forbes Twsp., Ontario	48 34 58	89 38 56	324	Sep 23, 1981	Oct 17, 1986
235a	UAPSP	15	Selma, Alabama	32 28 25	87 05 03	42	Oct 17, 1981	
235b	UAPSP	15 smplr 2	Selma-2, Alabama	32 28 25	87 05 03	42	Oct 23, 1981	Jan 22, 1983
236a	UAPSP	23	Yampa, Colorado	40 10 00	106 55 00	2390	Aug 12, 1982	
237a	UAPSP	14	Uvalda, Georgia	32 03 18	82 28 25	64	Oct 13, 1981	
237b	UAPSP	14 smplr 2	Uvalda-2, Georgia	32 03 18	82 28 25	64	Oct 9, 1983	Aug 3, 1984
238a	UAPSP	18	Lancaster, Kansas	39 34 10	95 18 17	346	Nov 5, 1981	
238b	UAPSP	18 smplr 2	Lancaster-2, Kansas	39 34 10	95 18 17	346	Oct 12, 1983	Oct 18, 1984
239a	UAPSP	11	Clearfield, Kentucky	38 08 10	83 27 17	235	Oct 24, 1981	
239b	UAPSP	11 smplr 2	Clearfield-2, Kentucky	38 08 10	83 27 17	235	Jun 25, 1985	Jun 20, 1986
240a	UAPSP	13	Winterport, Maine	44 37 05	68 58 30	67	Oct 21, 1981	
240b	UAPSP	13 smplr 2	Winterport-2, Maine	44 37 05	68 58 30	67	Oct 29, 1984	Nov 5, 1985
241a	UAPSP	10	Gaylord, Michigan	44 56 58	84 38 30	473	Nov 7, 1981	
242a	UAPSP	16	Clinton, Mississippi	32 21 06	90 17 15	76	Oct 20, 1981	
242b	NADP/NTN	251080	Clinton, Mississippi	32 18 24	90 19 05	96	Jul 10, 1984	
242c	UAPSP	16 smplr 2	Clinton-2, Mississippi	32 21 06	90 17 15	76	Dec 8, 1985	Dec 8, 1986
243a	UAPSP	21	Big Moose, New York	43 49 03	74 54 08	603	Oct 26, 1981	
243b	UAPSP	21 smplr 2	Big Moose-2, New York	43 49 03	74 54 08	603	Nov 22, 1985	Nov 26, 1986
244a	UAPSP	22	McArthur, Ohio	39 14 06	82 28 41	224	Oct 1, 1981	May 15, 1984
245a	UAPSP	19	Brookings, South Dakota	44 19 54	96 49 45	499	Oct 30, 1981	
245b	UAPSP	19 smplr 2	Brookings-2, South Dakota	44 19 54	96 49 45	499	Nov 18, 1981	Feb 23, 1983
246a	UAPSP	12	Alamo, Tennessee	35 47 32	89 08 03	112	Oct 23, 1981	
247a	UAPSP	17	Marshall, Texas	32 39 58	94 25 06	81	Oct 25, 1981	
247b	UAPSP	17 smplr 2	Marshall-2, Texas	32 39 58	94 25 06	81	Nov 23, 1984	Nov 12, 1985
248a	UAPSP	20	Underhill Center, Vermont	44 31 42	72 52 08	442	Oct 1, 1981	
248b	UAPSP	20 smplr 2	Underhill Center-2, Vermont	44 31 42	72 52 08	442	Oct 9, 1983	Oct 11, 1984
248c	NADP/NTN	470180	Underhill, Vermont	44 31 42	72 52 08	399	Jun 12, 1984	
249a	NADP/NTN	470100	Bennington, Vermont	42 52 34	73 09 48	305	Apr 28, 1981	
250a	NADP/NTN	482890	Shenandoah Nat'l, Virginia	38 31 21	78 26 10	1047	May 12, 1981	
251a	NADP/NTN	220155	NACL, Massachusetts	41 58 33	70 01 29	34	Dec 15, 1981	
252a	NADP/NTN	260380	Ashland, Missouri	38 45 13	92 11 55	239	Oct 20, 1981	
253a	NADP/NTN	260560	University Forest, Missouri	36 54 39	90 19 06	154	Oct 27, 1981	
254a	NADP/NTN	453800	Forest Seed Ctr, Texas	31 33 38	94 51 39	84	Aug 18, 1981	
255a	NADP/NTN	520820	Newcastle, Wyoming	43 52 24	104 11 32	1466	Aug 11, 1981	
257a	NADP/NTN	200011	Acadia > 11/81, Maine	44 22 27	68 15 39	122	Nov 3, 1981	
258a	NADP/NTN	232241	Chassell, Michigan	47 06 36	88 33 10	279	Feb 15, 1983	

ADS SITE IDENT	NET WORK	NET SITE IDENT	SITE NAME	LATITUDE d m s	LONGITUDE d m s	ELEVATION (meters)	FIRST ACTIVE DATE	LAST ACTIVE DATE
259a	EPA-IV	ALTAL	Tallassee, Alabama	32 34 03	85 55 54	153	Mar 30, 1982	
260a	EPA-IV	KYGRA	Grayson Lake, Kentucky	38 14 00	82 59 00	213	Apr 6, 1982	
261a	EPA-IV	GAHIW	Hiawassee, Georgia	33 53 24	83 40 24	654	May 4, 1982	
262a	EPA-IV	GASUM	Summerville, Georgia	34 28 21	85 24 27	202	May 25, 1982	
263a	EPA-IV	MSUNI	University, Mississippi	34 23 22	89 26 15	154	May 1, 1982	
264a	EPA-IV	TNCEN	Center Hill Res, Tennessee	36 02 20	85 43 59	305	Aug 26, 1982	
265a	EPA-IV	KYMAM	Mammoth Cave, Kentucky	37 13 00	86 04 00	219	Oct 26, 1982	
266a	EPA-IV	SCLON	Long Creek, South Carolina	34 48 19	83 14 17	602	Nov 9, 1982	
267a	EPA-IV	SCDEL	Delta, South Carolina	34 32 21	81 33 40	113	Dec 14, 1982	
268a	NADP/NTN	040260	Warren 2WSW, Arkansas	33 35 18	92 05 50	78	May 25, 1982	
269a	NADP/NTN	041620	Buffalo River, Arkansas	36 05 02	92 35 13	265	Jul 13, 1982	
270a	NADP/NTN	054200	Tanbark Flat, California	34 12 27	117 45 39	853	Jan 12, 1982	
271a	NADP/NTN	130480	Headquarters, Idaho	46 37 40	115 49 10	969	Jul 20, 1982	
272a	NADP/NTN	154100	Purdue U Ag Farm, Indiana	40 28 31	86 59 32	215	Jul 13, 1982	
273a	NADP/NTN	173120	Konza Prairie, Kansas	39 06 08	96 36 33	344	Aug 17, 1982	
274a	NADP/NTN	190620	N La Hill Farm, Louisiana	32 45 04	93 03 02	61	Nov 16, 1982	
275a	NADP/NTN	191260	Iberia, Louisiana	29 55 47	91 42 54	6	Nov 16, 1982	Jan 26, 1988
276a	NADP/NTN	220815	Quabbin Reservoir, Massachusetts	42 23 33	72 20 40	283	Mar 5, 1982	
277a	NADP/NTN	221325	East, Massachusetts	42 23 02	71 12 53	20	Feb 2, 1982	
278a	NADP/NTN	271340	Give Out Morgan, Montana	48 28 42	105 11 39	817	Sep 14, 1982	
279a	NADP/NTN	320720	Bandelier Nat'l, New Mexico	35 46 54	106 16 03	1998	Jun 22, 1982	
280a	NADP/NTN	320980	Cuba, New Mexico	36 02 27	106 58 17	2124	Feb 3, 1982	
281a	NADP/NTN	380260	Bull Run, Oregon	45 27 00	122 08 50	267	Jul 13, 1982	
282a	NADP/NTN	452180	Longview, Texas	32 22 53	94 42 49	107	Jun 29, 1982	
283a	NADP/NTN	512800	Lake Dubay, Wisconsin	44 39 53	89 39 08	338	Jun 29, 1982	
284a	NADP/NTN	520680	Pinedale, Wyoming	42 55 44	109 47 12	2388	Jan 26, 1982	
285a	NADP/NTN	312981	Washington Xing, New Jersey	40 18 54	74 51 17	72	Aug 4, 1981	
286a	CANSAP	03 080	Puntzi Mountain, British Columbia	52 07 00	124 05 00	911	Apr 1, 1974	Jan 1, 1977
287a	CANSAP	07 140	Armstrong, Ontario	50 17 00	88 54 00	323	Feb 25, 1974	Nov 1, 1976
288a	GLAD	142360010	Evanston, Illinois	42 03 36	87 40 25	183	Jul 7, 1981	
289a	GLAD	141220043	Jardine Plant, Illinois	41 53 41	87 36 23	194	Jun 2, 1981	
290a	GLAD	141220034	South Water Plant, Illinois	41 45 25	87 32 45	187	Jun 2, 1981	
291a	GLAD	230420002	Bay City, Michigan	43 39 30	83 53 45	187	Mar 24, 1981	
292a	GLAD	230860001	Beaver Island, Michigan	45 44 30	85 30 30	183	Sep 22, 1981	
293a	GLAD	230460004	Benton Harbor, Michigan	42 07 00	86 28 30	191	Feb 3, 1981	
294a	GLAD	232740001	Cooper Harbor, Michigan	47 28 00	87 52 00	191	Jun 23, 1981	May 17, 1983
295a	GLAD	232740002	Eagle Harbor, Michigan	47 27 28	88 09 42	188	Jun 14, 1983	
296a	GLAD	232940001	Empire, Michigan	44 51 16	86 02 08	233	Jun 21, 1981	
297a	GLAD	231420008	Escanaba, Michigan	45 44 30	87 03 30	196	Jun 9, 1981	
298a	GLAD	230080001	Gramd Marais, Michigan	46 40 00	85 58 00	191	Jul 14, 1981	
299a	GLAD	233660002	Mount Clemens, Michigan	42 34 00	82 50 40	176	Apr 20, 1982	
300a	GLAD	233660002	Mount Clemens, Michigan	42 37 02	82 53 25	187	Mar 24, 1981	Mar 9, 1982
301a	GLAD	233760007	Muskegon, Michigan	43 08 40	86 16 20	190	Mar 24, 1981	
302a	GLAD	234060002	Ontonagon, Michigan	46 49 20	89 38 00	194	Jul 7, 1981	
303a	GLAD	232340002	Port Austin, Michigan	44 02 50	82 59 40	185	Apr 7, 1981	
304a	GLAD	234800001	Port Sanilac, Michigan	43 26 20	82 32 32	190	Mar 17, 1981	
305a	GLAD	234110002	Tawas Point, Michigan	44 16 00	83 26 30	179	May 5, 1981	
306a	GLAD	241040029	Duluth, Minnesota	46 46 07	92 05 15	198	Jul 21, 1981	
307a	GLAD	241840016	Gooseberry Falls, Minnesota	46 24 40	91 28 48	206	Sep 22, 1981	
308a	GLAD	240900001	Gull Lake, Minnesota	46 24 40	94 21 15	383	Jan 19, 1982	
309a	GLAD	240800009	Hovland, Minnesota	47 50 50	89 57 45	224	Jul 21, 1981	
310a	GLAD	333340099	Cape Vincent, New York	44 05 30	76 20 30	80	Jan 19, 1982	
311a	GLAD	331600099	Dunkirk, New York	42 30 13	79 19 26	182	Jan 19, 1982	Sep 25, 1984
312a	GLAD	330860099	Fair Haven, New York	43 19 08	76 42 11	74	Jan 4, 1982	Nov 5, 1984
313a	GLAD	332000099	Grand Island, New York	43 03 30	78 58 00	173	Jan 19, 1982	
314a	GLAD	334720099	Olcott, New York	43 20 27	78 41 35	84	Jan 19, 1982	
315a	GLAD	335760099	Rochester, New York	43 13 48	77 34 45	81	Jan 19, 1982	
316a	GLAD	360200001	Ashtabula, Ohio	41 54 30	80 46 30	179	Jan 26, 1982	Sep 25, 1984

ADS SITE IDENT	NET WORK	NET SITE IDENT	SITE NAME	LATITUDE d m s	LONGITUDE d m s	ELEVATION (meters)	FIRST ACTIVE DATE	LAST ACTIVE DATE
317a	GLAD	362100001	Fairport Harbor, Ohio	41 45 17	81 16 25	203	Jan 27, 1981	
318a	GLAD	363620014	Lorain, Ohio	41 28 20	82 08 30	192	Feb 17, 1981	
319a	GLAD	365260001	Put-in-Bay, Ohio	41 39 29	82 49 40	177	Feb 17, 1981	
320a	GLAD	365200007	Toledo, Ohio	41 41 30	83 24 32	177	Jan 27, 1981	
321a	GLAD	393060099	Erie, Pennsylvania	42 07 48	80 06 03	183	Jan 18, 1982	
322a	GLAD	510180001	Cornucopia, Wisconsin	46 51 44	91 08 13	195	Feb 17, 1981	
323a	GLAD	510360001	Green Bay, Wisconsin	44 31 47	87 55 11	201	Mar 31, 1981	
324a	GLAD	513600001	Manitowoc, Wisconsin	44 03 56	87 39 23	189	Jul 7, 1981	
325a	GLAD	512200035	Milwaukee, Wisconsin	43 04 31	87 53 02	205	Mar 17, 1981	
326a	WISC	RDUND	Round Lake, Wisconsin	46 13 24	91 56 10	320	Aug 30, 1982	May 31, 1984
326b	UAPSP	25	Round Lake, Wisconsin	46 13 24	91 56 10	320	Jun 1, 1984	
326c	UAPSP	25 smplr 2	Round Lake-2, Wisconsin	46 13 24	91 56 10	320	Jan 11, 1986	
327a	WISC	LEGEND	Legend Lake, Wisconsin	44 53 30	88 37 47	270	Apr 22, 1982	May 31, 1984
328a	WISC	GENEVA	Geneva Lake, Wisconsin	42 34 48	88 30 03	290	Mar 28, 1982	May 31, 1984
328b	NADP/NTN	513680	Lake Geneva, Wisconsin	42 34 49	88 30 01	290	Jun 5, 1984	
329a	NADP/NTN	011000	Blackbelt, Alabama	32 27 30	87 14 31	58	Aug 31, 1983	
330a	NADP/NTN	040380	Caddo Valley, Arkansas	34 10 46	93 05 55	71	Dec 30, 1983	
331a	NADP/NTN	056820	Palomar Mountain, California	33 18 36	116 51 13	1686	Mar 15, 1983	Jan 12, 1988
332a	NADP/NTN	058501	Chuchupate, California	34 48 22	119 00 38	1623	Aug 2, 1983	
333a	NADP/NTN	060180	Las Animas, Colorado	38 07 04	103 18 57	1212	Oct 4, 1983	
334a	NADP/NTN	060220	Niwot Saddle, Colorado	40 03 19	105 35 18	3520	Jun 5, 1984	
335a	NADP/NTN	061920	Buffalo Pass, Colorado	40 32 20	106 40 35	3215	Feb 7, 1984	
336a	NADP/NTN	100380	Kennedy Space Cent, Florida	28 32 34	80 38 40	2	Aug 2, 1983	
337a	NADP/NTN	101400	Quincy, Florida	30 32 56	84 35 50	69	Mar 13, 1984	
338a	NADP/NTN	104100	Verna Well Field, Florida	27 22 48	82 17 02	25	Aug 25, 1983	
339a	NADP/NTN	112040	Bellville, Georgia	32 08 30	81 58 18	61	Apr 26, 1983	
340a	NADP/NTN	115000	Tifton, ARS, Georgia	31 28 25	83 31 59	104	Oct 4, 1983	
341a	NADP/NTN	131180	Reynolds Creek, Idaho	43 12 18	116 44 57	1198	Nov 22, 1983	
342a	NADP/NTN	061911	Rocky Mtn Nat'l Pa, Colorado	40 17 16	105 39 17	3159	Aug 16, 1983	
343a	NADP/NTN	152020	Huntington, Indiana	40 50 24	85 27 50	244	Aug 22, 1983	
344a	NADP/NTN	170740	Farlington, Kansas	37 39 04	94 48 24	282	Mar 27, 1984	
345a	NADP/NTN	173280	Scott Lake, Kansas	38 40 16	100 54 59	863	Mar 27, 1984	
346a	NADP/NTN	180360	Perryville, Kentucky	37 40 38	84 58 23	277	Nov 29, 1983	
347a	NADP/NTN	182260	Lilley Cornett Woo, Kentucky	37 04 40	82 59 37	335	Sep 6, 1983	
348a	NADP/NTN	183560	Clark State Fish H, Kentucky	38 07 06	83 32 49	204	Aug 30, 1983	
349a	NADP/NTN	193060	Southeast, Louisiana	30 48 41	90 10 51	78	Jan 18, 1983	
350a	NADP/NTN	211320	Wye, Maryland	38 54 47	76 09 09	6	Mar 8, 1983	
351a	NADP/NTN	230980	Raco, Michigan	46 22 26	84 44 31	260	May 1, 1984	
352a	NADP/NTN	242360	Camp Ripley, Minnesota	46 14 58	94 29 50	410	Oct 18, 1983	
353a	NADP/NTN	492180	La Grande, Washington	46 50 09	122 17 13	607	Apr 24, 1984	
354a	NADP/NTN	270560	Glacier Nat'l Park, Montana	48 44 28	113 25 48	1391	Jan 25, 1983	Sep 10, 1986
355a	NADP/NTN	270760	Clancy, Montana	46 29 07	112 04 04	1489	Jan 24, 1984	
356a	NADP/NTN	320840	Mayhill, New Mexico	32 54 34	105 28 14	2012	Jan 24, 1984	
357a	NADP/NTN	460120	Logan, Utah	41 39 30	111 53 49	1370	Dec 6, 1983	
358a	NADP/NTN	335141	West Point, New York	41 21 03	74 02 54	203	Sep 13, 1983	
359a	NADP/NTN	336840	Biscuit Brook, New York	41 59 39	74 30 13	634	Oct 11, 1983	
360a	NADP/NTN	343600	Jordan Creek, North Carolina	34 58 16	79 31 41	132	Oct 18, 1983	
361a	NADP/NTN	350880	Icelandic, North Dakota	48 46 57	97 45 15	308	Oct 25, 1983	
362a	NADP/NTN	351180	Woodworth, North Dakota	47 07 22	99 14 02	573	Nov 29, 1983	
363a	NADP/NTN	370060	Salt Plains Nation, Oklahoma	36 48 08	98 12 37	346	Dec 13, 1983	
364a	NADP/NTN	371740	Great Plains Apiar, Oklahoma	34 58 48	97 31 16	330	Mar 29, 1983	
365a	NADP/NTN	372580	Clayton Lake, Oklahoma	34 31 42	95 21 10	348	Feb 1, 1983	Aug 12, 1986
366a	NADP/NTN	380202	Hyslop Farm, Oregon	44 38 04	123 11 24	69	Apr 26, 1983	
367a	NADP/NTN	380980	Silver Lake Ranger, Oregon	43 07 22	121 03 28	1334	Aug 23, 1983	
368a	NADP/NTN	381800	Starkey Experiment, Oregon	45 13 32	118 30 42	1250	Mar 6, 1984	
369a	NADP/NTN	491940	Marblemount, Washington	48 32 32	121 26 44	120	Feb 7, 1984	
370a	NADP/NTN	491540	Sullivan Lake, Washington	48 50 32	117 17 04	796	May 8, 1984	Nov 24, 1987
371a	NADP/NTN	397220	Milford, Pennsylvania	41 19 39	74 49 13	212	Dec 27, 1983	

ADS SITE IDENT	NET WORK	NET SITE IDENT	SITE NAME	LATITUDE d m s	LONGITUDE d m s	ELEVATION (meters)	FIRST ACTIVE DATE	LAST ACTIVE DATE
372a	NADP/NTN	430061	Huron Well Field, South Dakota	44 21 18	98 17 38	398	Nov 29, 1983	
373a	NADP/NTN	430880	Cottonwood, South Dakota	43 56 57	101 51 30	733	Oct 11, 1983	
374a	NADP/NTN	450350	Beeville, Texas	28 27 55	97 42 40	75	Feb 7, 1984	
375a	NADP/NTN	451040	Attwater Prairie C, Texas	29 41 20	96 16 29	57	Jul 3, 1984	
376a	NADP/NTN	451650	Sonora, Texas	30 15 40	100 33 18	690	Jun 26, 1984	
377a	NADP/NTN	455180	Throckmorton, Texas	33 16 28	99 12 56	424	May 29, 1984	
378a	NADP/NTN	455640	LBJ National Grass, Texas	33 23 30	97 38 23	312	Sep 20, 1983	
379a	NADP/NTN	500460	Babcock State Park, West Virginia	37 58 47	80 56 59	631	Sep 6, 1983	
380a	GLAD	337240099	SODUS POINT, New York	43 16 24	76 58 32	78	Nov 13, 1984	
381a	GLAD	336240099	SILVER CREEK, New York	42 34 49	79 08 02	199	Oct 16, 1984	
382a	GLAD	361480001	CONNEAUT, Ohio	41 57 36	80 34 23	201	Oct 2, 1984	
383a	TVA	ALLEN 7	ALLEN 7, Tennessee	35 05 49	90 04 56	73	Nov 28, 1978	
384a	TVA	BULL RUN 8	BULL RUN 8, Tennessee	35 58 52	84 13 32	250	Nov 30, 1978	Aug 11, 1981
385a	TVA	COLBERT 1	COLBERT 1, Alabama	34 46 13	87 50 09	152	Dec 26, 1978	
386a	TVA	COLBERT 8	COLBERT 8, Alabama	34 46 18	87 54 05	146	Dec 26, 1978	Sep 2, 1980
387a	TVA	CUMBERLA 1	CUMBERLAND 1, Tennessee	36 26 23	87 36 17	180	Jun 28, 1977	Dec 30, 1980
388a	TVA	CUMBERLA 3	CUMBERLAND 3, Tennessee	36 36 05	87 27 03	165	Jun 28, 1977	Sep 2, 1980
389a	TVA	CUMBERLA 7	CUMBERLAND 7, Tennessee	36 19 29	87 41 30	195	Jun 29, 1977	Sep 2, 1980
390a	TVA	CUMBERLA 8	CUMBERLAND 8, Tennessee	36 25 58	87 42 30	130	Jun 29, 1977	Sep 2, 1980
391a	TVA	CUMBERLA14	CUMBERLAND 14, Tennessee	36 16 20	87 45 53	195	Jun 29, 1977	Sep 2, 1980
392a	TVA	CUMBERLA16	CUMBERLAND 16, Tennessee	36 31 14	87 33 48	174	Jun 28, 1977	Sep 2, 1980
393a	TVA	CUMBERLA18	CUMBERLAND 18, Tennessee	36 27 58	87 34 52	216	Jun 28, 1977	Sep 2, 1980
394a	TVA	CUMBERLA20	CUMBERLAND 20, Kentucky	36 50 17	87 10 12	230	Jun 28, 1977	Sep 2, 1980
395a	TVA	CUMBERLA21	CUMBERLAND 21, Tennessee	36 10 13	87 50 50	115	Jul 1, 1977	Sep 2, 1980
396a	TVA	CUMBERLA22	CUMBERLAND 22, Tennessee	36 26 07	87 36 08	178	Dec 26, 1979	
397a	TVA	GALLATIN 6	GALLLATIN 6, Tennessee	36 17 21	86 23 11	158	Nov 14, 1978	Mar 24, 1981
398a	TVA	JOHN SEVI4	JOHN SEVIER 4, Tennessee	36 26 02	85 58 40	347	Nov 28, 1978	Dec 27, 1983
399a	TVA	JOHNSONV11	JOHNSONVILLE 11, Tennessee	36 01 33	88 02 43	131	Nov 14, 1978	Mar 24, 1981
400a	TVA	KINGSTON 2	KINGSTON 2, Tennessee	35 59 17	84 32 40	317	Jan 9, 1979	Jul 14, 1981
401a	TVA	PARADISE24	PARADISE 24, Kentucky	37 11 20	86 58 38	139	Nov 21, 1978	Mar 24, 1981
402a	TVA	SHAWNEE 13	SHAWNEE 13, Kentucky	37 04 09	88 46 21	118	May 5, 1981	
403a	TVA	SHAWNEE 20	SHAWNEE 20, Kentucky	37 08 40	88 49 17	107	Dec 26, 1978	Dec 30, 1980
404a	TVA	SHAWNEE 22	SHAWNEE 22, Kentucky	37 08 18	88 48 12	113	Dec 30, 1980	May 5, 1981
405a	TVA	WATTS BAR2	WATTS BAR 2, Tennessee	35 37 46	84 46 29	238	Jan 9, 1979	Jul 14, 1981
406a	TVA	WIDOWS C3	WIDOWS CREEK 3, Alabama	34 51 31	85 43 21	469	Nov 14, 1978	Mar 24, 1981
407a	TVA	WIDOWS C9	WIDOWS CREEK 9, Alabama	34 52 04	85 43 17	457	Mar 24, 1981	
408a	TVA	WIDOWS C23	WIDOWS CREEK 23, Alabama	35 55 05	85 44 02	209	Nov 14, 1978	Mar 24, 1981
409a	TVA	HYTOP	HYTOP, Alabama	34 53 39	86 05 36	544	May 1, 1978	Oct 14, 1980
411a	TVA	LOUDON	LOUDON, Tennessee	35 38 30	84 18 45	271	May 17, 1978	Oct 9, 1980
412a	TVA	LOVES MILL	LOVES MILL, Virginia	36 44 12	81 41 13	663	May 16, 1978	Sep 4, 1984
412b	NADP/NTN	483300	Loves Mill, Virginia	36 44 12	81 41 12	660	Oct 2, 1984	Jul 2, 1985
413a	EPA-IV	SCCAP	Cape Romain, South Carolina	32 56 32	78 39 27	5	Aug 3, 1983	
414a	EPA-IV	SCCON	Congaree Swamp, South Carolina	33 48 56	80 49 38	32	Sep 27, 1983	
415a	APIOS-C	5141	Turkey Lake, Ontario	47 03 15	84 24 00	472	Sep 13, 1983	
416a	APIOS-C	6121	Geraldton, Ontario	49 48 05	86 46 00	351	Aug 16, 1983	
417a	APIOS-C	5151	Azure Lake, Ontario	47 28 12	81 52 30	244	Jul 24, 1983	
418a	APIOS-C	4091	Cloyne, Ontario	44 49 09	77 11 45	259	Dec 4, 1984	
420a	NADP/NTN	152260	Southwest Purdue, Indiana	38 44 27	87 29 08	134	Sep 25, 1984	
421a	NADP/NTN	160880	Big Springs Fish H, Iowa	42 54 35	91 28 11	228	Aug 14, 1984	
422a	NADP/NTN	162320	McNay Research Sta, Iowa	40 57 47	93 23 35	320	Sep 11, 1984	
423a	NADP/NTN	183860	Land Between the L, Kentucky	36 47 26	88 04 02	181	Oct 2, 1984	
423b	TVA	LBL	LBL, Kentucky	36 47 27	88 04 01	177	Jun 30, 1977	Oct 1, 1985
424a	NADP/NTN	210360	White Rock, Maryland	39 24 04	76 59 42	165	Oct 3, 1984	
425a	NADP/NTN	253000	Coffeeville, Mississipp	34 00 10	89 47 59	134	Jul 17, 1984	
426a	NADP/NTN	270060	Custer Battlefield, Montana	45 34 06	107 26 14	957	Jul 13, 1984	
427a	NADP/NTN	290140	Saval Ranch, Nevada	41 17 00	115 49 31	1865	Jul 18, 1984	
429a	NADP/NTN	420680	Santee National Wi, South Carolina	33 29 17	80 21 49	24	Jul 19, 1984	
431a	NADP/NTN	520260	Sinks Canyon, Wyoming	42 43 30	108 51 00	2164	Aug 21, 1984	

ADS SITE IDENT	NET WORK	NET SITE IDENT	SITE NAME	LATITUDE d m s	LONGITUDE d m s	ELEVATION (meters)	FIRST ACTIVE DATE	LAST ACTIVE DATE
432a	NADP/NTN	011020	Sand Mountain Exp, Alabama	34 17 30	85 57 32	347	Oct 2, 1984	
433a	NADP/NTN	131500	Smiths Ferry, Idaho	44 17 52	116 03 49	1385	Oct 9, 1984	
435a	NADP/NTN	441400	Hatchie National W, Tennessee	35 28 04	89 09 32	107	Oct 2, 1984	
436a	NADP/NTN	200046	Presque Isle, Maine	46 39 17	68 00 32	186	Jun 5, 1984	
437a	NADP/NTN	321280	Capulin Mountain, New Mexico	36 46 44	103 58 54	2207	Nov 15, 1984	
438a	NADP/NTN	452215	Guadalupe Mountain, Texas	31 54 30	104 48 32	1768	Jun 5, 1984	
440a	NADP/NTN	512500	Suring-NADP, Wisconsin	45 03 11	88 22 21	247	Jan 23, 1985	
442a	NADP/NTN	520681	Gypsum Creek, Wyoming	43 13 22	109 59 27	2428	Dec 26, 1984	
443a	NADP/NTN	147860	Monmouth, Illinois	40 56 00	90 43 23	0	Jan 8, 1985	
444a	NADP/NTN	290080	Red Rock Canyon, Nevada	36 08 00	115 25 16	1119	Jan 22, 1985	
445a	NADP/NTN	290560	Lehman Caves, Nevada	39 00 23	114 13 04	2067	Jan 15, 1985	
446a	NADP/NTN	372920	Goodwell Research, Oklahoma	36 35 27	101 37 03	999	Jan 8, 1985	
447a	NADP/NTN	402020	El Verde, Puerto Rico	18 19 28	65 48 53	430	Feb 12, 1985	
448a	NADP/NTN	460110	Bryce Canyon, Utah	37 37 04	112 10 22	2475	Jan 29, 1985	
449a	NADP/NTN	460281	Green River, Utah	38 59 54	110 09 55	1244	Apr 25, 1985	
450a	NADP/NTN	520261	South Pass City, Wyoming	42 29 41	108 49 45	2512	Apr 30, 1985	
451a	UAPSP	24	Shawano, Wisconsin	44 42 30	88 37 28	255	Oct 13, 1984	
452a	APIOS-C	6111	Otter Island, Ontario	48 06 50	86 04 25	204	Apr 24, 1984	
452b	APIOS-D	6111	Otter Island, Ontario	48 06 50	86 04 25	204	Jun 23, 1984	Nov 17, 1984
453a	CAPMoN	5061376	Island Lake, Manitoba	53 52 00	94 40 00	245	Sep 1, 1983	
454a	CAPMoN	5041706	McCreary, Manitoba	50 43 00	99 32 00	335	Sep 1, 1983	
455a	CAPMoN	6116716	Priceville, Ontario	44 10 00	80 40 00	475	Jul 1, 1984	
455b	CAPMoN	6116719	Priceville 2, Ontario	44 10 00	80 40 00	475	Apr 14, 1985	
456a	CAPMoN	7028292	Sutton, Quebec	45 05 00	72 41 00	243	Sep 1, 1983	
456b	CAPMoN	7028293	Sutton 2, Quebec	45 05 00	72 41 00	243	Jan 8, 1985	
456c	NADP/NTN	777570	Sutton, Quebec	45 04 35	72 40 35	290	Sep 16, 1986	
456d	APIOS-C	7011	Sutton, Quebec	45 04 35	72 40 35	290	Oct 8, 1986	
456e	APIOS-D	7011	Sutton, Quebec	45 04 35	72 40 35	290	Oct 8, 1986	
457a	CAPMoN	8102151	Harcourt, New Brunswick	46 29 00	65 15 00	45	Aug 1, 1983	
457b	CAPMoN	8102149	Harcourt QC, New Brunswick	46 29 00	65 15 00	45	Jan 9, 1986	
458a	CAPMoN	8202562	Jackson, Nova Scotia	45 36 00	63 50 00	91	Aug 2, 1983	
459a	CAPMoN	8401289	Cormack, Newfoundland	49 16 00	57 28 00	120	Aug 1, 1983	Jul 1, 1985
460a	CAPMoN	8401291	Cormack-B, Newfoundland	49 19 00	57 24 00	168	Jun 1, 1985	Apr 30, 1986
461a	CAPMoN	6070QK6	Bonner Lake, Ontario	49 23 00	82 07 00	245	Jun 11, 1985	
461b	CAPMoN	6070QK6	Bonner Lake 2, Ontario	49 23 00	82 07 00	245	Jan 1, 1988	
462a	CAPMoN	6158361	AES HQ, Ontario	43 47 00	79 28 00	191	Apr 1, 1985	
463a	CAPMoN	6169291	Warsaw Caves, Ontario	44 28 00	78 08 00	230	Mar 8, 1985	
464a	EPA-IV	ALMOB	Mobile, Alabama	30 40 07	88 13 13	8	Oct 9, 1984	
465a	EPA-IV	GADAW	Dawsonville, Georgia	00 00 00	00 00 00	314	Aug 6, 1985	
466a	EPA-IV	GADUF	McDuffie, Georgia	33 53 24	83 40 34	132	Sep 18, 1985	
467a	EPA-IV	GAWAY	Waycross St. Fores, Georgia	00 00 00	00 00 00	41	Oct 17, 1985	
468a	EPA-III	DEGEO	Georgetown, Delaware	38 37 20	75 27 30	5	Jul 3, 1984	
469a	EPA-III	DELUM	Lum's Pond, Delaware	39 34 10	75 43 50	20	Jun 14, 1984	
470a	EPA-III	MDRGP	Rocky Gap, Maryland	39 43 12	78 38 13	378	Jul 31, 1984	
471a	EPA-III	MD3EC	The Elms, Maryland	38 12 03	76 22 30	2	Aug 28, 1984	
472a	EPA-III	WVAPC	Charleson APC, West Virginia	38 20 31	81 37 11	183	Aug 7, 1984	Feb 4, 1987
473a	EPA-III	WVGRN	Greenbrier, West Virginia	37 48 39	80 30 46	823	Aug 8, 1984	Jan 27, 1987
474a	EPA-III	WVNEW	New Manchester, West Virginia	40 31 42	80 34 32	366	Jul 17, 1985	Mar 5, 1987
475a	EPA-III	WVWAR	Warwood Ave, West Virginia	40 07 14	80 41 59	212	Oct 18, 1984	Mar 5, 1987
476a	EPA-VI	LACAR	Carville, Louisiana	30 14 27	91 09 33		Feb 26, 1985	
477a	EPA-VI	LACHS	Chase, Louisiana	32 05 13	91 44 31		Mar 4, 1985	
478a	EPA-VI	LAROS	Rosepine, Louisiana	30 55 21	93 19 22		Mar 12, 1985	
479a	TVA	JOHN SEVI2	JOHN SEVIER 2, Tennessee	36 23 20	82 56 03	370	Dec 27, 1983	
480a	NADP/NTN	057680	Montague, California	41 45 57	122 28 42	805	Jun 25, 1985	
481a	NADP/NTN	061980	Engineer Mountain, Colorado	37 39 34	107 47 57	2758	Jul 29, 1986	
482a	NADP/NTN	061981	Molas Pass, Colorado	37 45 08	107 41 21	3286	Jul 29, 1986	
483a	NADP/NTN	112380	Fort Frederica Nat, Georgia	31 13 31	81 23 32	3	Sep 3, 1985	
484a	NADP/NTN	232571	Isle Royale Nat'l, Michigan	48 03 27	88 38 02	207	May 22, 1985	

ADS SITE IDENT	NET WORK	NET SITE IDENT	SITE NAME	LATITUDE d m s	LONGITUDE d m s	ELEVATION (meters)	FIRST ACTIVE DATE	LAST ACTIVE DATE
485a	NADP/NTN	270740	Havre Experiment S, Montana	48 29 52	109 47 44	815	Jul 30, 1985	
486a	NADP/NTN	281580	North Platte Ag. E, Nebraska	41 03 35	100 44 56	919	Sep 24, 1985	
487a	NADP/NTN	290360	Smith Valley, Nevada	38 47 57	119 15 24	1501	Aug 7, 1985	
488a	NADP/NTN	320180	Gila Cliff Dwellin, New Mexico	33 13 26	108 14 12	1781	Jul 29, 1985	
489a	NADP/NTN	344500	Clingman's Peak, North Carolina	35 44 07	82 17 10	1987	Nov 26, 1985	
490a	NADP/NTN	450250	Muleshoe Nat'l Wil, Texas	33 57 20	102 46 34	1144	Jun 18, 1985	
491a	NADP/NTN	460820	Murphy Ridge, Utah	41 21 27	111 02 55	2146	Mar 25, 1986	
492a	NADP/NTN	492420	Palouse Conservati, Washington	46 45 38	117 11 05	766	Aug 20, 1985	
493a	NADP/NTN	520020	Snowy Range, Wyoming	41 22 34	106 15 34	3286	Apr 22, 1986	
494a	EPA-IV	GABFG	Ealonton, GA, Georgia	99 99 99		172	Jun 3, 1986	
495a	APIOS-C	5161	Moosonee, Ontario	51 12 35	80 42 20	10	Oct 1, 1985	
496a	APIOS-D	4101	Wilmer, Ontario	44 26 15	76 31 45	155	Oct 24, 1985	
497a	CAPMoN	7046086	Port Cartier, Quebec	50 08 00	67 07 00	180	Dec 1, 1985	
498a	CAPMoN	3012459	Esther, Alberta	51 40 00	110 12 00	714	Jan 12, 1986	
499a	NADP/NTN	060221	Sugarloaf, Colorado	39 59 33	105 28 48	2524	Nov 4, 1986	
500a	NADP/NTN	061921	Dry Lake, Colorado	40 32 05	106 46 48	2527	Oct 14, 1986	
501a	NADP/NTN	251960	Newton, Mississippi	32 20 05	89 09 58	147	Nov 11, 1986	
502a	NADP/NTN	265000	Baker Observatory, Missouri	37 23 55	93 02 33	415	Oct 14, 1986	
503a	NADP/NTN	482900	Whitetop Mountain, Virginia	36 38 20	81 36 22	1680	Sep 30, 1986	
504a	NADP/NTN	510960	Popple River, Wisconsin	45 47 46	88 23 58	421	Dec 30, 1986	
504b	NADP/NTN	510961	Popple River Inter, Wisconsin	45 47 46	88 23 58	421	Dec 30, 1986	
505a	NADP/NTN	520021	Nash Fork, Wyoming	40 20 25	106 11 20	2856	Nov 18, 1986	
506a	CAPMoN	7091294	Chapais, Quebec	49 49 00	74 58 00	381	Oct 14, 1987	
507a	APIOS-D	6131	Dawson Creek, Ontario	48 33 38	89 38 60	381	Oct 1, 1986	
508a	EPA-VIII	SDAPR	Pierre, South Dakota	44 20 38	100 14 42	434	Oct 28, 1986	
508b	EPA-VIII	SDBPR	Pierre2, South Dakota	44 20 38	100 14 42	434	Oct 28, 1986	
509a	EPA-VIII	SDBGP	Buffalo Gap, South Dakota	43 32 58	103 24 39	1024	Nov 25, 1986	Jan 21, 1987
510a	EPA-VIII	SDCUS	Custer Nat'l Park, South Dakota	00 00 00	00 00 00	0	Sep 3, 1987	
511a	NADP/NTN	060880	Four Mile Park, Colorado	39 24 11	107 20 28	2502	Dec 29, 1987	
512a	NADP/NTN	060881	Sunlight Peak, Colorado	39 25 38	107 22 48	3206	Jan 13, 1988	

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