Cedar Lane Atmospheric Deposition Station
Town of Lake George, Warren County, New York

1991 – 2006 Summaries of Annual and Monthly Precipitation
2006 Hourly Precipitation
1980 – 2006 Atmospheric Deposition Loading

by

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Introduction

The Cedar Lane Atmospheric Deposition Station was established by the Department of Environmental Conservation during 1980 to collect data for the Lake George Urban Runoff Study (US EPA Nationwide Urban Runoff Program). The station was in operation until 1984, discontinued for a period of time, and then re-established by the Department during 1991. Wetfall, dryfall, and bulk deposition samples were collected at the station for chemical analysis during the 1980's, in addition to a continuous record of the amount of precipitation (wet and frozen). Wetfall, dryfall and precipitation volume have been collected at this site since 1991. In 2001, a bulk collector was also installed at the site.

The station is located in the Lake George Beach and Battlefield State Park, near the intersection of Beach Road and Cedar Lane, in the Town of Lake George. The Lake George Park Commission has provided financial support for this station by paying electric service bills for the operation of equipment. Since 1998, the FUND for Lake George has covered the analytical costs associated with deposition samples collected at this site through a contract with the Darrin Fresh Water Institute (DFWI). In 2006, the DFWI assumed daily operation of the Cedar Lane Atmospheric Deposition Station.

Equipment and Operation

Precipitation

Precipitation volume data at this station is collected with a Qualimetrics, Inc. Model 6021A tipping bucket rain-snow gage that tips once for each 0.01 inches of wetfall. The gage is equipped with heaters to allow the accurate measurement of frozen precipitation. The tipping mechanism in the gage is associated with a mercury-reed switch that sends a signal to a Telog Instruments, Inc. Model R-2107 event recorder for each tip that occurs.

The event recorder provides a continuous record of precipitation at the Cedar Lane station, it is programmed to summarize and store the information at 5-minute intervals. This report summarizes the data at hourly intervals. However, a greater resolution can be provided for individual storm events upon request to the Darrin Fresh Water Institute.

The precipitation values presented in this report are in inches and the hourly intervals during which precipitation occurred are in Eastern Standard Time.

The precipitation gage is calibrated regularly to maintain accuracy. A special calibration unit, filled with water, is inverted and placed in the gage funnel and dispenses water equivalent to a 1.00 inch storm event, into the tipping bucket. Following the calibration, the event recorder is checked to determine the number of bucket tips that occurred during the procedure. Theoretically, 100 tips are equivalent to 1.00 inch of precipitation. Maintenance on the gage, such as leveling, etc., is indicated if the recorder results do not fall within a 2 percent range ($\pm$ 0.02 inches) of the theoretical value.

Atmospheric deposition – Wetfall, Dryfall and Bulk

An Aerochem-Metrics Inc. wet/dry deposition collector and a custom-made bulk precipitation collector are installed at this site. The Aerochem-Metrics collector has a precipitation sensor that triggers the bucket to move from the wet to the dry bucket if precipitation is detected. In dry (non-precipitation) periods, the wetfall bucket is covered, allowing dry deposition, such as by-products of combustion, to collect in the dryfall bucket. The bulk collector is open at all times and thus collects wet and dry deposition.

Wetfall, dryfall and bulk sample analytes are listed in Table 1. The wetfall bucket is collected after every rain event of approximately four tenths of an inch or more, or after several smaller events, so that there is sufficient volume to process for all analytes. Dryfall and bulk are collected every three weeks. To process dryfall samples, 600 mL of de-ionized water are added in order to have sufficient volume to process all of the analytes. Dryfall data collected at Cedar Lane Atmospheric Deposition station from 1980 through 1984 and 1991 to the present have not been included in the current loading estimates for several different reasons including 1) a low number of individual samples collected during certain years, and 2) problems inherent with the collection and processing of dry deposition data. Bulk chemistry has not been calculated for this report because of the short time period during which data have been collected.

Table 1. Analytes measured for Wetfall, Dryfall and Bulk samples.

Analytes	Wetfall	Dryfall	Bulk
Total Phosphorus	X	X	X
Total soluble P	X	X	X
Soluble Reactive P	X	X	X
Total nitrogen	X	X	X
Nitrite	X	X	X
Nitrate	X	X	X
Ammonia	X	X	X
Chloride	X	X	X
Sulfate	X	X	X
Silica	X	X	X
Sodium	X	X	X
Magnesium	X	X	X
Calcium	X	X	X
Potassium	X	X	X
Conductivity	X	X	X
pH	X		
Acid Neutralizing Capacity	X		

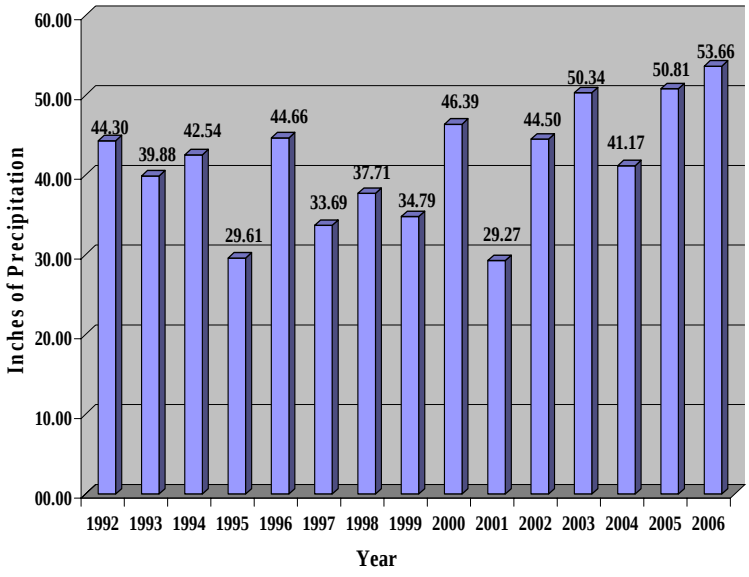
Data Analysis

Precipitation

Total Annual Precipitation

Figure 1 presents the total annual precipitation measured at the Cedar Lane station during the period 1992 through 2006. Since the station was not re-established at this site until May of 1991, the data record for 1991 is incomplete, and is not included in the figure.

Figure 1. Total Annual Precipitation at Cedar Lane, 1992-2006

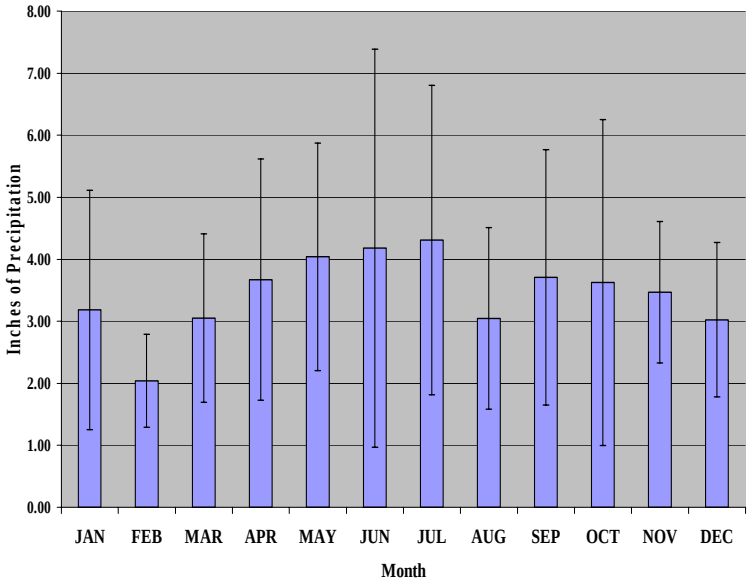


During the 15 years of continuous record at this station, the total annual precipitation has ranged from a high value of 53.66 inches during 2006 to a low of 29.27 inches during 2001. As cited in the Final Report for the Lake George Urban Runoff Study (Sutherland et al., 1983), the average annual precipitation for the Lake George region is about 40 inches. To date, the total annual precipitation has exceeded 40 inches during nine of the fifteen years recorded at the Cedar Lane station. The average precipitation for the period of record is 41.55 inches.

Monthly Precipitation

Figure 2 shows the values for average monthly precipitation at the Cedar Lane station for the period of record. Since the station was established during mid-May in 1991, the months January through May are represented by fifteen years of record, while the months June through December are represented by sixteen years of record. Based on the record to date, July has been the wettest month, with an average of 4.31 inches of precipitation. February has been the driest month, with an average of 2.04 inches of precipitation. The wide range of standard deviation lines above and below the mean values indicates a large variation in the monthly values among the various years. This standard deviation should continue to decrease as the period of record increases at the station. Appendix I contains the annual precipitation summary data for the period of record.

Figure 2. Average Monthly Precipitation at Cedar Lane, 1991-2006

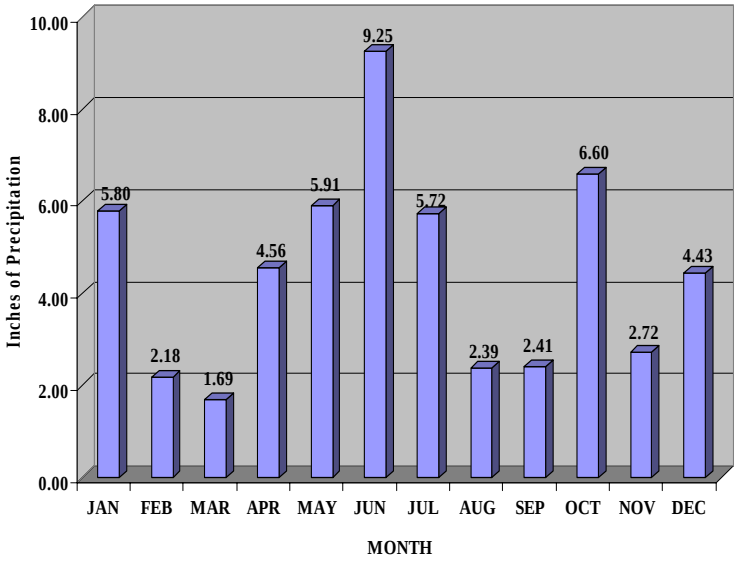


2006 Precipitation

The total precipitation recorded at Cedar Lane during 2006 was 53.66 inches. The monthly values of precipitation ranged from a high value of 9.25 inches during June to a low value of 1.69 inches during March (Figure 3).

The 2006 hourly summaries of precipitation are presented in Appendix II.

Figure 3. 2006 Monthly Precipitation at Cedar Lane



Wetfall Chemistry

The volume-weighted concentrations of wetfall samples are shown in Appendix III and the loadings of the wetfall samples are shown in Appendix IV. Appendices V through IX compare NADA annual concentrations in Huntington, NY and the volume-weighted concentrations at the Cedar Lane Atmospheric Deposition Station.

Table 2. Percent of Total Precipitation sampled during the study period at the Cedar Lane Atmospheric Deposition Station.

Year	Total Precipitation	Total Sampled Precipitation	Percent of Precipitation Sampled
1980	34.48	13.41	38.9*
1981	34.83	34.08	97.8
1982	23.66	20.94	88.5
1983	60.67	54.92	90.5
1984	44.54	32.94	74.0
gap in collection			
1992	44.30	42.30	95.5
1993	39.88	27.95	70.1
1994	42.54	35.99	84.6
1995	29.61	16.70	56.4*
1996	44.66	16.97	38.0*
1997	33.69	20.08	59.6*
1998	37.71	27.42	72.7
1999	34.79	31.83	91.5
2000	46.39	44.61	96.2
2001	29.27	27.63	94.4
2002	44.50	43.72	98.2
2003	50.34	48.95	97.2
2004	41.17	41.18	100.0
2005	50.81	50.83	100.0
2006	53.66	52.23	97.3

Figures 4 through 10 illustrate the trends of the volume-weighted concentrations of important analytes found in precipitation and analyzed for this study. In figures 4 through 7 and figure 10, there is a noticeable decline in the volume-weighted concentrations of the analytes measured over all of the years of the study. It is interesting to note that the years 1980 and 1995-1997 have a much lower total percent of precipitation sampled, shown in Table 2, than the other years of the study, which may have an affect on the volume-weighted concentrations of those years.

Figure 4 presents the volume-weighted concentrations of total and total soluble phosphorous during the study period, showing an uneven trendline, which indicates that the phosphorus values may be dependent on weather patterns. During most years, there is an increase in raw total phosphorus values during the months of March, April and May. Several factors could explain this phenomenon. First, after spring snowmelt dirt and dust, to which phosphorus particles may be adsorbed, is exposed. These particles can be picked up by wind, transported in the atmosphere, and deposited with precipitation. Second, the spring season has an abundance of pollen, high bird-nesting activity, and greater number of insects. Bird droppings, insects or insect parts, or pollen deposition during a precipitation event also are sources of phosphorus. All of these are considered contamination and are indicated on field sheets and in field books when samples are collected. By checking field data sheets and field books, samples that were contaminated with bird droppings, pollen, or insects were verified and removed from the phosphorus loading dataset.

Figure 5 shows the volume-weighted concentrations of nitrate. Nitrate is a constituent of emissions and its concentrations are dependent on the origin of the storm event. Long-range transport of nitrate particles from Mid-West emission sources is a key factor that contributes to the acidification of Adirondack lakes and ponds.

The volume-weighted concentrations of chloride levels from 1980-2006 tend to be higher during the winter months when salt is applied to the roads during storms. During non-event periods, salt

will dry on the roads and is then easily picked up by wind and deposited with the next precipitation event. Chloride values also will fluctuate depending on the severity of the winter, which dictates the amount of salt applied to the roads for de-icing purposes.

Sulphate volume-weighted concentrations range from a high of 3.79 mgS/L in 1980 to a low of 0.26 mgS/L in 2004. Unlike the other analytes, sulphate volume-weighted concentrations drop consistently over time, with an R^2 of 0.88 (Figure 7). This steady decline in sulphate concentrations can be attributed to the Clean Air Act Amendments of 1990. It is interesting to compare the Cedar Lane sulphate concentration trends to that of the National Atmospheric Deposition Program sulphate concentrations in Huntington, NY (Appendix VII) (NADP website).

Figure 8 shows the volume-weighted concentrations of calcium. There is an insufficient record of calcium data to make any inferences about trends in this report.

Figure 9 shows the volume-weighted concentration of pH from 1980-2006. The graph shows that the pH values have remained fairly constant over time. All atmospheric deposition in the northeastern United States is acidic, with values ranging between 4 and 6 standard units, depending upon location. The atmospheric deposition collected at the Cedar Lane station has pH values ranging from 4.26 to 4.87 over the study period, which are consistent with acidic precipitation in the Adirondack region of New York State.

The volume-weighted concentrations of conductivity values are shown in Figure 10. The graph shows a slow decline over the study period, indicating a general reduction of positive and negative ions in the atmospheric deposition at the station. This may be attributed to the recent mild winters where the application of salt (a contributor to high conductivity values) is reduced.

Figure 11 shows the Acid Neutralizing Capacity (ANC) values of each sample analyzed for the years 1983, 1984, and 1992 through 2006. The inset shows the theoretical relationship between pH and ANC values. The data in Figure 11 fit an extension of the bottom half of the theoretical curve.

Literature Cited

National Atmospheric Deposition Program website. http://nadp.sws.uiuc.edu. NADP/NTN Data Access.

Sutherland, James W., Jay A. Bloomfield, and James M. Swart. 1983. Final Report *for the* Lake George Urban Runoff Study, Nationwide Urban Runoff Program. Bureau of Water Research, New York State Department of Environmental Conservation, Albany, NY. 84 Pages + appendices.

Figure 4. Volume-weighted concentrations of Total Phosphorus and Total Soluble Phosphorus in Wetfall from 1980 through 2006 at the Cedar Lane Atmospheric Deposition Station

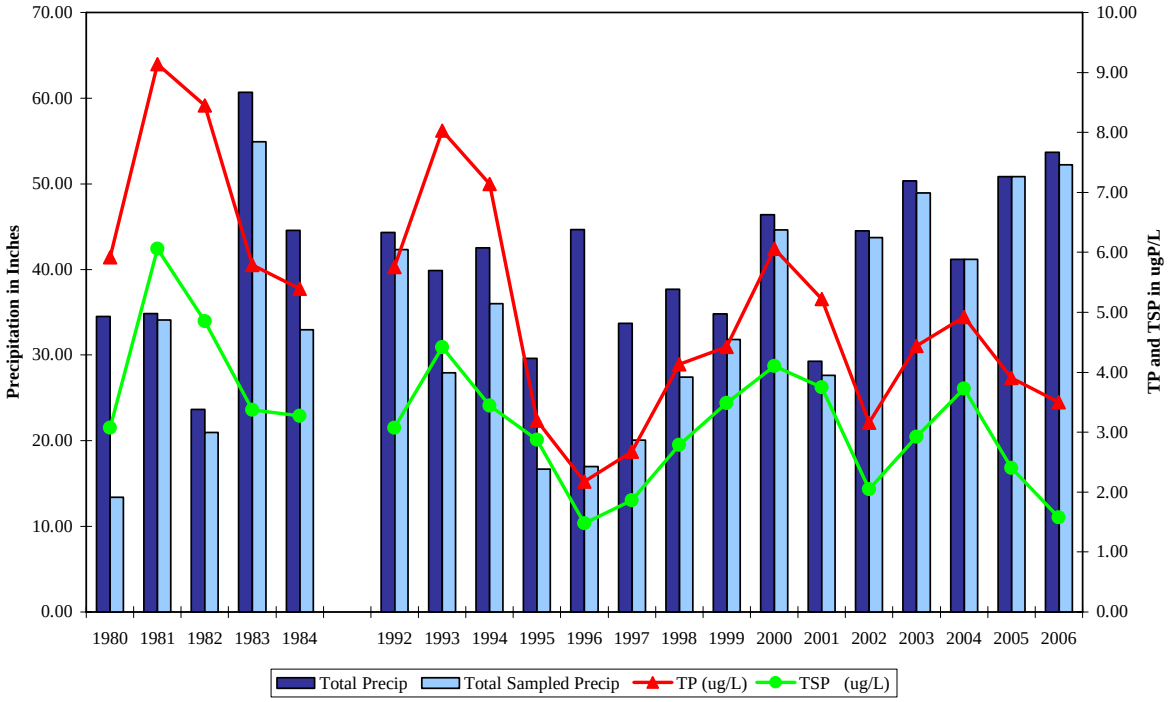


Figure 5. Volume-weighted concentrations of Nitrate measured in Wetfall from 1980 through 2006 at the Cedar Lane Atmospheric Deposition Station

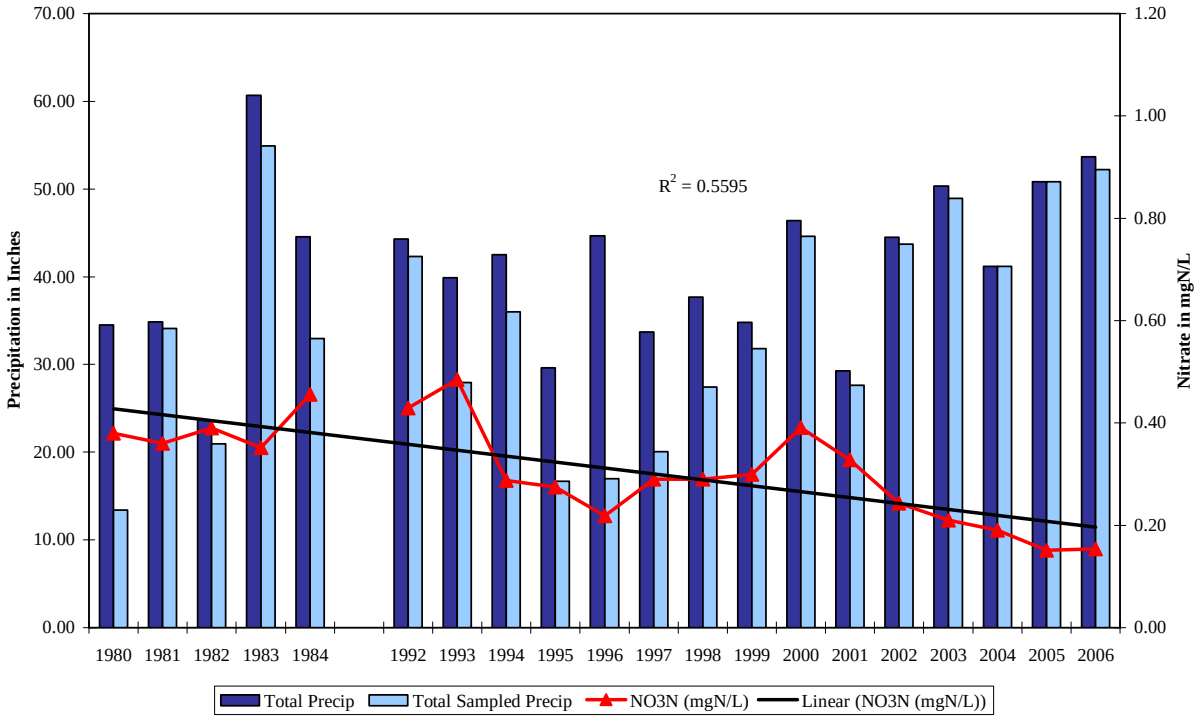


Figure 6. Volume-weighted concentrations of Chloride measured in Wetfall from 1980 through 2006 at the Cedar Lane Atmospheric Deposition Station

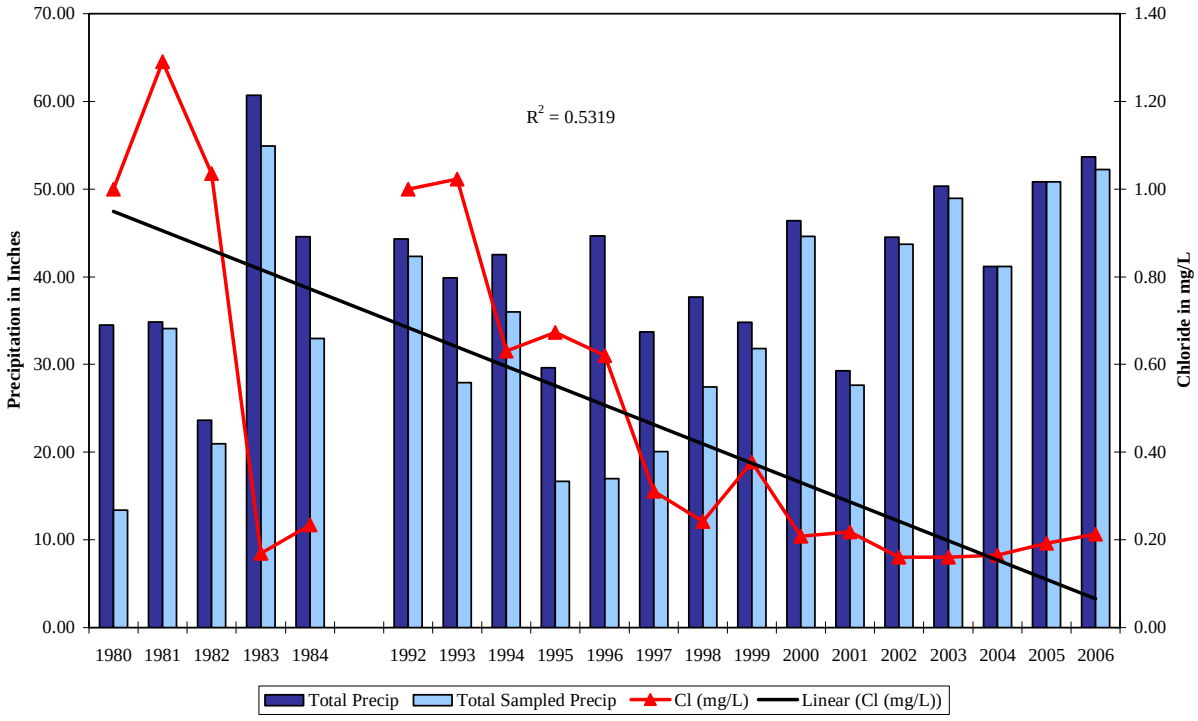


Figure 7. Volume-weighted concentrations of Sulfate measured in Wetfall from 1980 through 2006 at the Cedar Lane Atmospheric Deposition Station

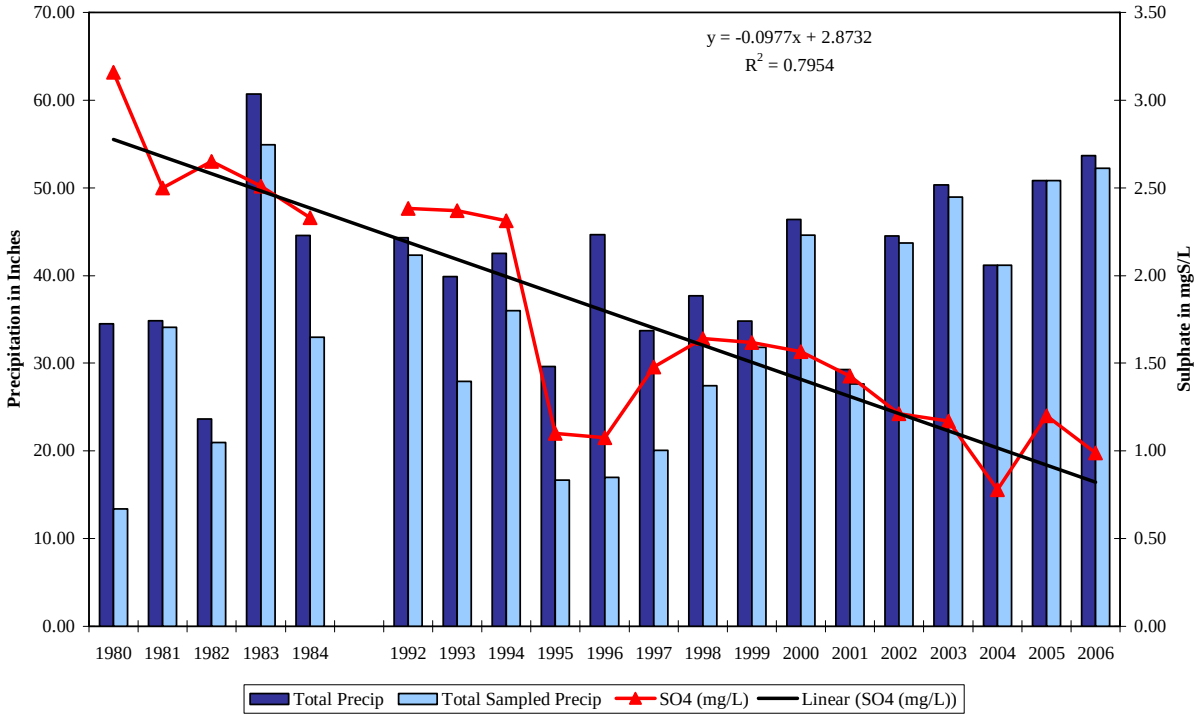


Figure 8. Volume-weighted concentrations of Calcium measured in Wetfall from 1980 through 2006 at the Cedar Lane Atmospheric Deposition Station

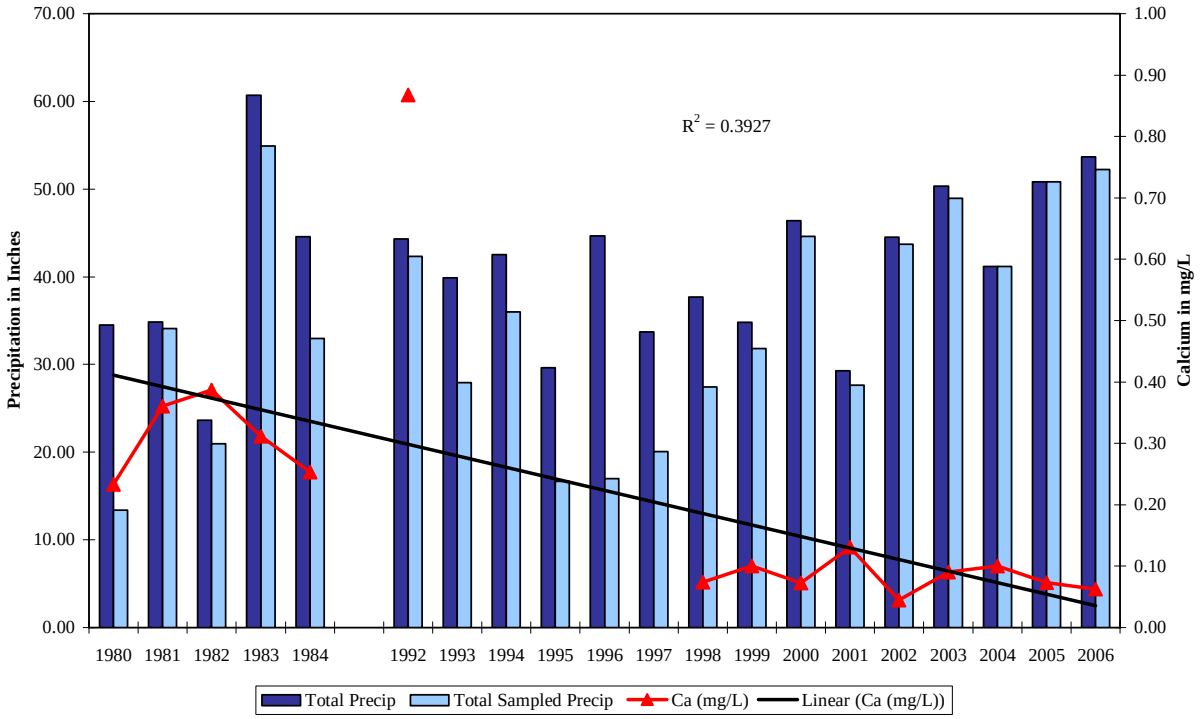


Figure 9. Volume-weighted concentrations of pH measured in Wetfall from 1980 through 2006 at the Cedar Lane Atmospheric Deposition Station

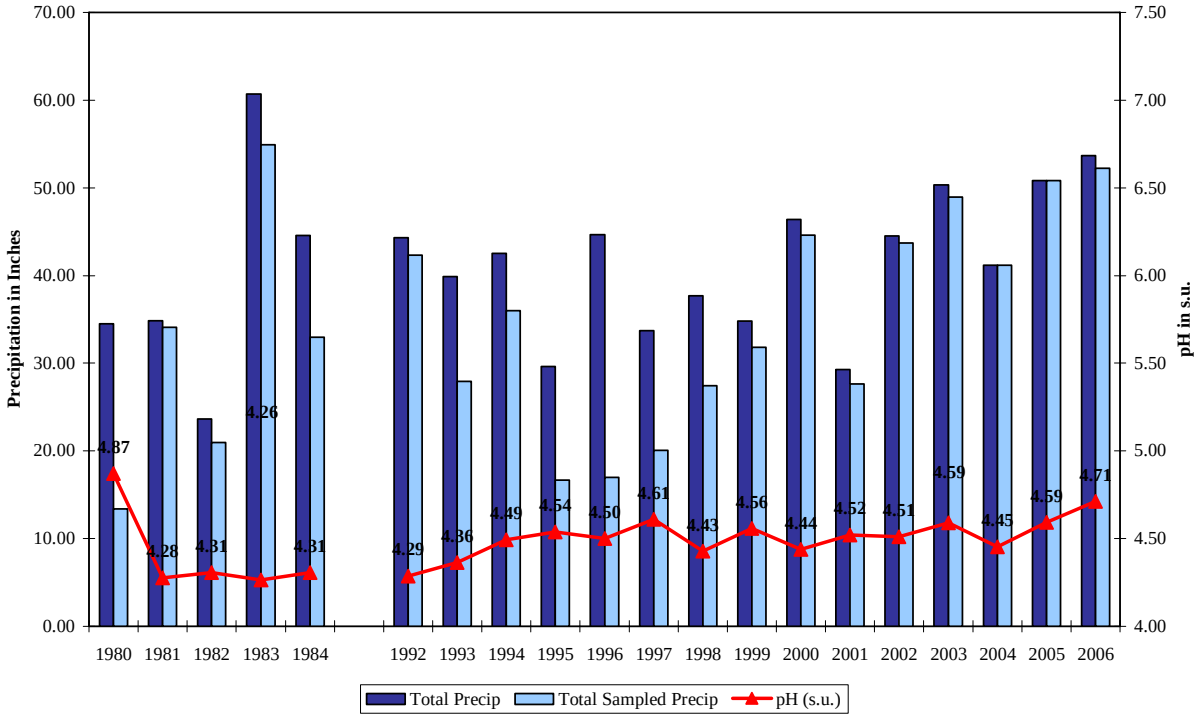


Figure 10. Volume-weighted concentrations of Conductivity measured in Wetfall from 1980 through 2006 at the Cedar Lane Atmospheric Deposition Station

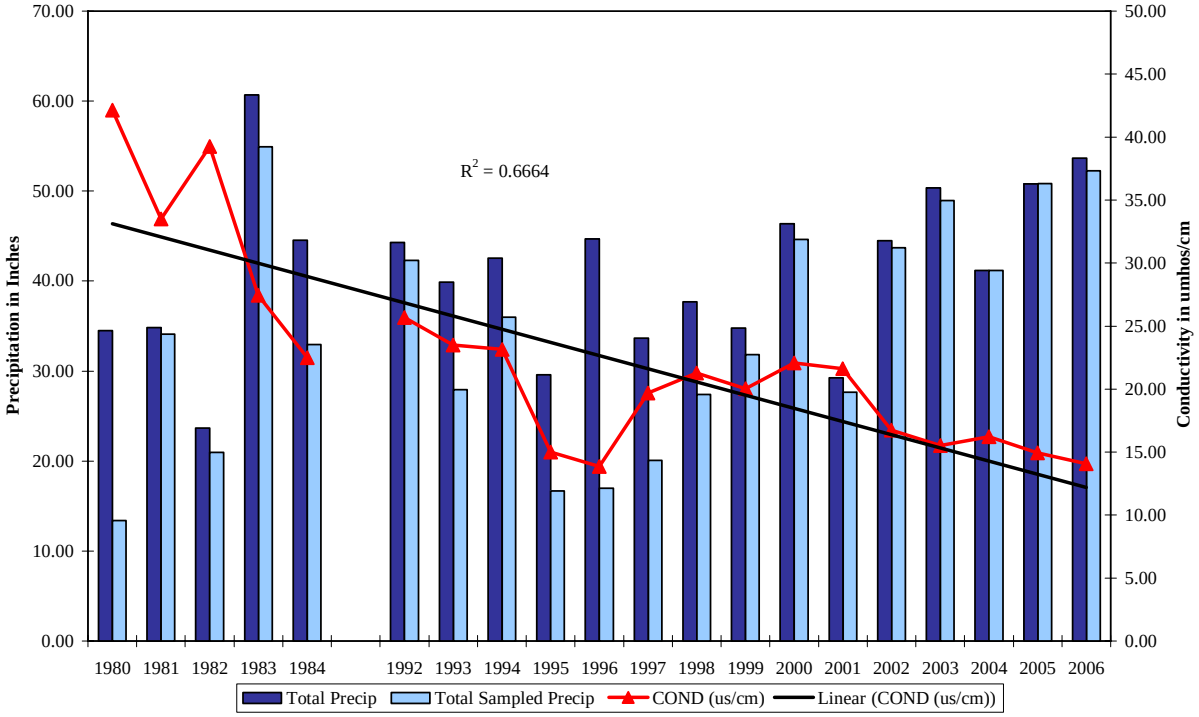
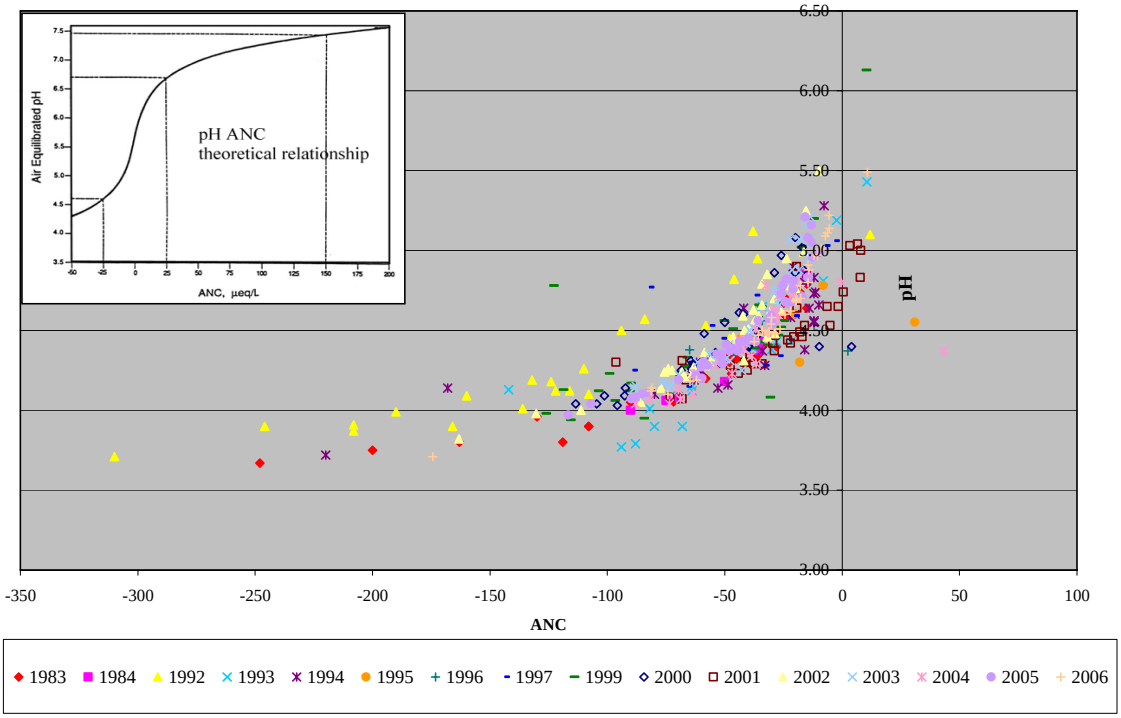


Figure 11. pH/ANC



APPENDIX I

Appendix I. Summary of Monthly and Annual precipitation at Cedar Lane from 1991 through 2006

	MONTHLY TOTALS												YEAR
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1991						1.37	2.58	3.07	4.90	4.00	3.44	2.79	22.15
1992	2.66	1.89	2.90	3.73	5.12	1.55	6.92	4.40	4.14	2.56	5.71	2.72	44.30
1993	3.60	3.96	3.61	6.41	3.03	2.90	1.58	2.50	2.83	3.29	3.32	2.85	39.88
1994	3.35	0.93	4.64	3.25	4.19	5.37	6.24	5.65	2.33	0.59	2.92	3.08	42.54
1995	2.30	1.69	1.40	1.92	1.58	1.24	1.83	2.05	1.71	8.51	3.67	1.71	29.61
1996	5.30	1.54	1.20	6.50	4.27	1.98	8.76	1.28	4.35	2.40	3.13	3.95	44.66
1997	1.69	1.52	4.70	2.69	2.61	2.21	3.23	2.49	2.99	2.39	5.15	2.02	33.69
1998	6.26	1.64	3.36	2.33	3.60	8.40	3.14	2.78	1.11	1.48	1.93	1.68	37.71
1999	6.02	2.53	3.89	0.71	2.32	1.76	2.60	1.75	7.42	2.20	2.36	1.23	34.79
2000	4.06	2.95	2.95	5.96	5.08	4.22	6.63	3.18	1.22	2.74	2.80	4.60	46.39
2001	0.98	1.85	5.47	1.10	3.00	4.67	2.06	1.35	3.83	1.40	2.00	1.56	29.27
2002	1.64	2.69	4.16	3.31	5.13	7.04	1.38	2.30	5.43	3.97	4.34	3.11	44.50
2003	1.04	2.06	2.02	3.85	6.78	2.48	5.13	4.48	8.15	6.21	3.89	4.25	50.34
2004	0.63	1.33	1.35	2.25	7.10	1.30	8.12	6.03	3.59	1.06	3.18	5.23	41.17
2005	2.40	1.82	2.40	6.48	0.90	11.13	3.02	3.03	2.90	8.59	4.94	3.20	50.81
2006	5.80	2.18	1.69	4.56	5.91	9.25	5.72	2.39	2.41	6.60	2.72	4.43	53.66
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
MEAN	3.18	2.04	3.05	3.67	4.04	4.18	4.31	3.05	3.71	3.62	3.47	3.03	41.55
STDEV	1.93	0.75	1.36	1.95	1.83	3.21	2.49	1.46	2.06	2.63	1.14	1.25	
NUMBER	15	15	15	15	15	16	16	16	16	16	16	16	

APPENDIX II

Appendix II. Summary of Hourly Precipitation at Cedar Lane for 2006

	HOUR ENDING																							Daily	YTD
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	Total
1/1	.01																								0.01	0.01
1/2																								.01	0.01	0.02
1/3	.04																								0.04	0.06
1/4	.01																								0.01	0.07
1/5	.01	.01					.01		.03	.02															0.08	0.15
1/9						.01																			0.01	0.16
1/11																		.01	.12	.15	.04	.01	.02	.01	0.36	0.52
1/14				.01	.10	.07	.07	.10	.10	.01	.03	.01			.07	.13	.02								0.72	1.24
1/17																				.01	.03	.02	.01	.03	0.10	1.34
1/18	.14	.14	.01	.16	.20	.22	.27	.35	.38	1.11	.07	.23	.30	.13											3.71	5.05
1/25															.06										0.06	5.11
1/29															.02	.05	.11	.10	.01	.03	.02		.01		0.35	5.46
1/30	.01																						.04		0.05	5.51
1/31			.03	.06	.01	.06	.04	.02	.01						.03	.02		.01							0.29	5.80
																TOTAL FOR JANUARY =							5.80		
2/3	.01			.01	.04	.03	.09	.12	.22	.19	.08	.03			0.01										0.83	6.63
2/4																				.12		.12	.04	.01	0.29	6.92
2/5			.02	.21	.10	.10																	.02		0.45	7.37
2/17							.01	.06	.07	.11		.01													0.26	7.63
2/21																	.01								0.01	7.64
2/22																									0.00	7.64
2/23											.07	.01													0.08	7.72
2/25									.03	.05	.05	.05	0.02	0.01		.02	.02	.01							0.26	7.98
																TOTAL FOR FEBRUARY =							2.18		
3/9										.03	.04	.03	.03	.03		.02	.02								0.20	8.18
3/10								.01					.01	.01											0.03	8.21
3/12												.01													0.01	8.22
3/13									.01	.10	.20	.30	.04	.03					.07	.32	.10			.04	1.21	9.43
3/14			.05	.02	.13	.04																			0.24	9.67
																TOTAL FOR MARCH =							1.69		
4/1		.02									.10	.09													0.21	9.88
4/4	.05	.06	.08	.07	.04	.03	.07	.09	.30	.42	.01		.01			.01									1.24	11.12
4/7												.01	.06	.02	.04	.01									0.14	11.26
4/15			.05	.02																					0.07	11.33
4/22													.01	.05	.10	.04	.04	.06	.06	.08	.07	.05	.03	.04	0.63	11.96
4/23	.06	.04	.11	.11	.09	.10	.08	.05	.26	.30	.24	.22	.27	.09	.12	.09			.03						2.26	14.22
4/24														.01											0.01	14.23
																TOTAL FOR APRIL =							4.56		
5/2													.01	.06	.04	.02		.01	.01						0.15	14.38
5/3					.01	.01	.02			.01	.01				.01		.03	.03							0.13	14.51
5/4																									0.00	14.51
5/6														.01											0.01	14.52
5/12					.01	.05	.26	.12	.08	.10	.03	.06	.03	.06	.03	.11	.08	.07	.02		.01	.01		.12	1.25	15.77
5/13	.37	.37	.14	.08																					0.96	16.73
5/14						.04	.01	.01	.17	.19	.13	.09	.04	.02	.04	.05	.02							.01	0.82	17.55
5/15	.01	.01													.01	.05	.01								0.09	17.64
5/16												.02	.01			.01	.02								0.06	17.70
5/18																					.01	.01			0.02	17.72
5/19								0.03	.01	.02	.16	.14	.19	.05	.05	.01									0.66	18.38
5/21										.06	.03	.06	.01								.01	.02			0.19	18.57
5/26														.02											0.02	18.59
5/29						.01	.01																		0.02	18.61
5/30															1.26	.10	.07	.01							1.44	20.05
5/31																			.04	.05					0.09	20.14
																TOTAL FOR MAY =							5.91		

	HOUR ENDING																								Daily	YTD
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	Total
6/2	.03	.01				.02		.08															.04	.04	0.22	20.36
6/3		.01		.01	.01	.12	.27	.27	.22	.21	.18	.07	.07	.02	.03	.07	.14	.05	.05	.07	.04	.01			1.92	22.28
6/5							.01																		0.01	22.29
6/7														0.05	0.12	0.21	0.1	0.06	0.09	0.01	0.01				0.65	22.94
6/8	.01			.08	.02	.01																			0.12	23.06
6/9		.01	.01	.05		.01	.02			.01												.07	.07	.01	0.26	23.32
6/15															.01	.01									0.02	23.34
6/17							.06																		0.06	23.40
6/19														.07											0.07	23.47
6/25																			.01	.02	.03	.04	.07	.09	0.26	23.73
6/26	.20	.35	.19	.05	.20	.23	.13	.17	.24	.54	.23	.54	.11	.17	.17		.04	.07	.01				.07		3.71	27.44
6/28		0.01	.01	.23	.25	.10	.10	.05	.08	.01															0.84	28.28
6/29			.27			.02												.07		.56	.19				1.11	29.39
																TOTAL FOR JUNE =							9.25			

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	Total
7/11				.04	.01																				0.05	29.44
7/12											.13	.09	.17	.33	.33	.14	.10	.19	.19	.02				.05	1.74	31.18
7/13	.01	.01						.01																	0.03	31.21
7/15														.01											0.01	31.22
7/21				.03	.02		.02			.02															0.09	31.31
7/22									.03	.62	.83	.52	.78	.44	.14		.01	.01							3.38	34.69
7/27											.02														0.02	34.71
7/28									.01				.27	.04	.01										0.33	35.04
7/29													.07												0.07	35.11
																TOTAL FOR JULY =							5.72			

8/4	0.01	.18	.06	.03	.03		.01																		0.32	35.43
8/7			.18	.01																					0.19	35.62
8/10																	.11								0.11	35.73
8/19										.01	.05	.02	.01				.01	.01	.01	.01	.01			.02	0.16	35.89
8/20	.09	.09	.14	.13	.01																				0.46	36.35
8/23												.06													0.06	36.41
8/27						.01	.02	.28		.17	.04	.01		.01	.02	.03			.01		.01				0.61	37.02
8/29		.01	.03	.02	.03	.02	.04	.03	.05	.02	.05	.09	.08						.01						0.48	37.50
																TOTAL FOR AUGUST =							2.39			

9/3		.03	.06	.01	.12	.05	.02	.02	.03	.02					.01			.03							0.40	37.90
9/6												.01													0.01	37.91
9/13							.01	.01	.01																0.03	37.94
9/14											.01	.02	.03	.04			.03	.04	.01		.09	.17	.09	.04	0.57	38.51
9/15	.01							.04																	0.05	38.56
9/19													.01	.01											0.02	38.58
9/23			.01		.04	.02	.01	.03																	0.11	38.69
9/24										.06	.02														0.08	38.77
9/25	0.01	.01	.01																						0.03	38.80
9/28																								.02	0.02	38.82
9/29	0.17	.53	.04	.06		.02	.02	.05	.08	.04	.01														1.02	39.84
9/30																			.02		.03	.01	.01		0.07	39.91
																TOTAL FOR SEPTEMBER =							2.41			

10/1						.07	.06	.05	.36	.12	.10	.05	.01	.01		.01	.01	.01	.02						0.88	40.79
10/4																				.04	.01				0.05	40.84
10/11																				.01	.05	.09	.15	.04	0.34	41.18
10/12			.01																						0.01	41.19
10/17												.04	.02	.05	.12	.13	.09	.06	.06	.07	.14	.14	.09		1.01	42.20
10/18	.03	.06	.03			.01																			0.13	42.33
10/19																		.12	.04	.03	.18	.05	.10	.08	0.60	42.93
10/20	.03	.01	.04	.07	.06	.04	.04	.01			.02	.05	.20	.29	.21	.15	.02								1.24	44.17
10/22													.01	.06				.01							0.08	44.25
10/28	.08	.11	.13	.13	.10	.10	.18	.17	.22	.33	.22	.23	.15	.04	.05	.01						.01			2.26	46.51
																TOTAL FOR OCTOBER =							6.60			

	HOUR ENDING																							Daily	YTD
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	Total
11/1																								.02	0.02	46.53
11/2	.05	.07	.02	.01																					0.15	46.68
11/8											.02	.01	.04	.09	.07	.06	.13	.15	.10	.01					0.68	47.36
11/11																				.01	.01		.04		0.06	47.42
11/12																		.01	.06	.05	.01	.01	.06	.10	0.30	47.72
11/13																		.01							0.01	47.73
11/14					.01		.01	.01									.01	.05							0.09	47.82
11/15									.01	.01															0.02	47.84
11/16	0.01	.01						.01											.21	.33	.29	.02	.03	.04	0.95	48.79
11/17	0.19	.12						.11																	0.42	49.21
11/19																		.01							0.01	49.22
11/30						.01																			0.01	49.23
																TOTAL FOR NOVEMBER =							2.72		
12/1		.03	.11	.08	.06	.07	.12	.08	.05	.01	.05			.02	.21	.11	.24	.57	.02						1.83	51.06
12/13									.03	.05	.04	.06													0.18	51.24
12/15																.09			.01						0.10	51.34
12/22																	.03	.03	.08	.09	.10	.08	.10	.11	0.62	51.96
12/23	.09	.07	.08	.10	.11	.13	.10	.06	.04	.02	.01	.01	.01												0.83	52.79
12/25																				.01	.05	.16	.09	.06	0.37	53.16
12/26	.14	.08	.05	.04	.03	.02	.01	.02	.01	.05	.03														0.48	53.64
12/30										.01	.01														0.02	53.66
																TOTAL FOR DECEMBER =							4.43		
																TOTAL FOR YEAR =							53.7		

APPENDIX III

Appendix III. Volume-weighted concentrations of parameters measured in wetfall from 1980 through 2006 at the Cedar Lane Atmospheric Deposition Station.

Atmospheric Deposition Analytes

Year	OP (ug P/L)	MRP (ug/L)	TSP (ug P/L)	TP (ug P/L)	SKN (mg/L)	TKN (mg/L)	TN (mg N/L)	NO2N (mg N/L)	NO3N (mg N/L)	TOC (mg/L)	SOC (mg/L)	NH4N (mg N/L)	Cl (mg/L)
1980U*				8.34	0.15	0.57			0.46			0.22	0.22
1980H**		2.81	3.07	5.92	0.20	0.28			0.38	3.20	1.14	0.15	1.00
1981U				9.74	0.51				0.43			0.25	0.47
1981H		3.77	6.06	9.14	0.29	0.38			0.36	1.87	1.27	0.21	1.29
1982U				10.98					0.40			0.17	0.32
1982H		2.42	4.85	8.45	0.26	0.30			0.39	1.62	1.30	0.16	1.04
1983H			3.37	5.79		0.35			0.35	1.70		0.25	0.17
1984H			3.27	5.39	0.31	0.36			0.46	1.03		0.23	0.23
1992H		1.56	3.07	5.75	0.27	0.31		2.08	0.43	1.59	1.34	0.20	1.00
1993H		1.28	4.42	8.03	0.34	0.42		1.23	0.48	1.17	1.07	0.20	1.02
1994H		1.08	3.44	7.14	0.32	0.38		1.02	0.29	1.31	1.14	0.20	0.63
1995H		1.84	2.87	3.19	0.18	0.23		1.00	0.27	1.08	0.88	0.12	0.67
1996H		0.91	1.48	2.18	0.14	0.20		1.00	0.22	0.53	0.37	0.09	0.62
1997H		0.58	1.86	2.67	0.46	0.56		2.96	0.29	0.91	0.77	0.14	0.31
1998D^	3.37		2.79	4.13			0.58	0.01	0.29			0.21	0.24
1999D	2.94		3.48	4.42			0.52	0.01	0.30			0.17	0.38
2000D	3.58		4.10	6.06			0.57	0.01	0.39			0.20	0.21
2001D	2.90		3.74	5.22			0.60	0.01	0.33			0.20	0.22
2002D	2.05		2.05	3.16			0.44	0.02	0.24			0.17	0.16
2003D	2.15		2.92	4.44			0.37	0.03	0.21			0.18	0.16
2004D	2.90		3.73	4.92			0.45	0.03	0.19			0.19	0.16
2005D	2.21		2.41	3.91			0.35	0.03	0.15			0.16	0.19
2006D	1.61		1.58	3.50			0.33	0.03	0.15			0.14	0.21

Atmospheric Deposition Analytes

Year	SO4 (mg S/L)	Si (mg/L)	Na (mg/L)	Mg (mg/L)	Ca (mg/L)	K (mg/L)	Fe (mg/L)	Al (mcg/L)	Pb (mcg/L)	pH (s.u.)	pH (as H+)	COND (umhos/cm)
1980U*	3.16		0.22	0.08	0.37	0.18			11.02			
1980H**	3.79		0.31	0.05	0.23	0.06			10.00	4.87	4.85	42.12
1981U	2.50		0.33	0.07	0.15	0.09			9.66			
1981H	2.67		0.29	0.06	0.36	0.06			8.69	4.28	4.26	33.51
1982U	2.65		0.21	0.15	0.33	0.05				4.42	4.38	37.08
1982H	3.43		0.33	0.07	0.39	0.07			9.90	4.31	4.30	39.25
1983H	2.51		0.29	0.07	0.31	0.07		33.47		4.26	4.25	27.44
1984H	2.31		0.12	0.06	0.25	0.04		32.52		4.31	4.30	22.48
1992H	2.38	0.02	0.97	0.81	0.87	0.81	0.03	165.43	8.05	4.29	4.27	25.67
1993H	2.37								3.75	4.36	4.34	23.48
1994H	2.31								2.81	4.49	4.48	23.16
1995H	1.10								2.50	4.54	4.54	14.99
1996H	1.08								2.38	4.50	4.49	13.85
1997H	1.48								2.50	4.61	4.60	19.66
1998D^	1.64	0.09	0.04	0.02	0.07	0.01	0.03			4.43	4.42	21.27
1999D	1.62	0.01	0.09	0.03	0.10	0.02	0.02			4.56	4.54	20.03
2000D	1.57	0.05	0.07	0.03	0.07					4.44	4.43	22.07
2001D	1.43	0.06	0.09	0.02	0.13					4.52	4.51	21.62
2002D	1.21	0.05	0.07	0.03	0.05					4.51	4.50	16.74
2003D	1.17	0.06	0.06	0.01	0.09					4.59	4.52	15.52
2004D	0.78	0.05	0.05	0.01	0.10					4.45	4.45	16.21
2005D	1.20	0.05	0.08	0.02	0.07	0.03				4.59	4.58	14.93
2006D	0.99	0.05	0.09	0.02	0.06	0.02				4.71	4.70	14.07

* U = samples analyzed by USGS

** H = samples analyzed by the NYS Department of Health

^ D = samples analyzed by the Darrin Fresh Water Institute

APPENDIX IV

Appendix IV. Loadings of analytes measured in Wetfall from 1980 through 2006 at the Cedar Lane Atmospheric Deposition Station.

Atmospheric Deposition Analytes ($g/m^2/yr$)

Year	OP	MRP	TSP	TP	SKN	TKN	TN	NO2N	NO3N	TOC	SOC
1980H*		0.0025	0.0027	0.0052	0.1737	0.2471			0.3323	2.8035	0.9963
1981H		0.0033	0.0054	0.0081	0.2550	0.3389			0.3188	1.6509	1.1275
1982H		0.0015	0.0029	0.0051	0.1551	0.1788			0.2344	0.9757	0.7796
1983H			0.0052	0.0089		0.5430			0.5418	2.6186	
1984H			0.0037	0.0061	0.3458	0.4056			0.5161	1.1686	
1992H		0.0018	0.0035	0.0065	0.3038	0.3463		2.3440	0.4826	1.7920	1.5093
1993H		0.0013	0.0045	0.0081	0.3444	0.4242		1.2491	0.4908	1.1808	1.0813
1994H		0.0012	0.0037	0.0077	0.3447	0.4122		1.0990	0.3104	1.4191	1.2362
1995H		0.0014	0.0022	0.0024	0.1378	0.1725		0.7521	0.2067	0.8142	0.6643
1996H		0.0010	0.0017	0.0025	0.1630	0.2281		1.1344	0.2477	0.5987	0.4148
1997H		0.0005	0.0016	0.0023	0.3913	0.4776		2.5347	0.2486	0.7771	0.6602
1998D**	0.0032		0.0027	0.0040			0.5579	0.0048	0.2783		
1999D	0.0026		0.0031	0.0039			0.4601	0.0048	0.2646		
2000D	0.0042		0.0048	0.0071			0.6697	0.0059	0.4602		
2001D	0.0022		0.0028	0.0039			0.4459	0.0037	0.2436		
2002D	0.0023		0.0023	0.0036			0.4987	0.0196	0.2754		
2003D	0.0028		0.0038	0.0057			0.4767	0.0386	0.2705		
2004D	0.0030		0.0039	0.0051			0.4706	0.0314	0.1987		
2005D	0.0029		0.0031	0.0050			0.4453	0.0339	0.1948		
2006D	0.0022		0.0022	0.0048			0.4453	0.0341	0.2093		

Atmospheric Deposition Analytes ($g/m^2/yr$)

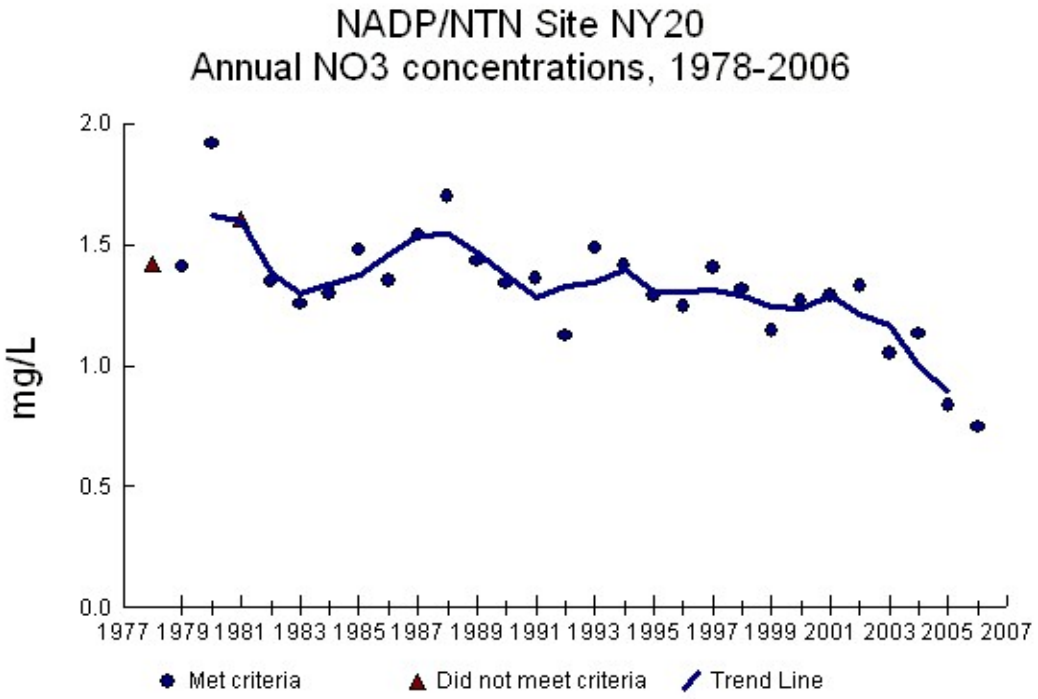
Year	NH4N	Cl	SO4	Si	Na	Mg	Ca	K	Fe	Al	Pb
1980H*	0.1323	0.8758	2.7675		0.2745	0.0438	0.2046	0.0558			0.0088
1981H	0.1832	1.1412	2.2117		0.2548	0.0559	0.3188	0.0539			0.0077
1982H	0.0972	0.6222	1.5926		0.1989	0.0396	0.2326	0.0396			0.0060
1983H	0.3881	0.2607	3.8674		0.4481	0.1011	0.4798	0.1015		0.0516	
1984H	0.2561	0.2646	2.6360		0.1358	0.0697	0.2861	0.0421		0.0368	
1992H	0.2297	1.1252	2.6810	0.0195	1.0896	0.9106	0.9761	0.9106	0.0363	0.1861	0.0091
1993H	0.2017	1.0362	2.4014								0.0038
1994H	0.2133	0.6807	2.4997								0.0030
1995H	0.0876	0.5066	0.8283								0.0019
1996H	0.0977	0.7034	1.2210								0.0027
1997H	0.1183	0.2656	1.2658								0.0021
1998D**	0.1977	0.2315	1.5708	0.0838	0.0424	0.0150	0.0709	0.0135	0.0249		
1999D	0.1498	0.3334	1.4309	0.0083	0.0788	0.0228	0.0888	0.0145	0.0145		
2000D	0.2353	0.2448	1.8454	0.0589	0.0768	0.0352	0.0857				
2001D	0.1486	0.1618	1.0602	0.0426	0.0656	0.0116	0.0975				
2002D	0.1968	0.1817	1.3704	0.0565	0.0775	0.0288	0.0510				
2003D	0.2319	0.2061	1.5073	0.0773	0.0773	0.0129	0.1159				
2004D	0.1987	0.1724	0.8157	0.0523	0.0572	0.0105	0.1046				
2005D	0.2049	0.2478	1.5500	0.0645	0.1001	0.0218	0.0941				
2006D	0.1895	0.2904	1.3464	0.0681	0.1212	0.0237	0.0848	0.0300			

* H = samples analyzed by the NYS Department of Health

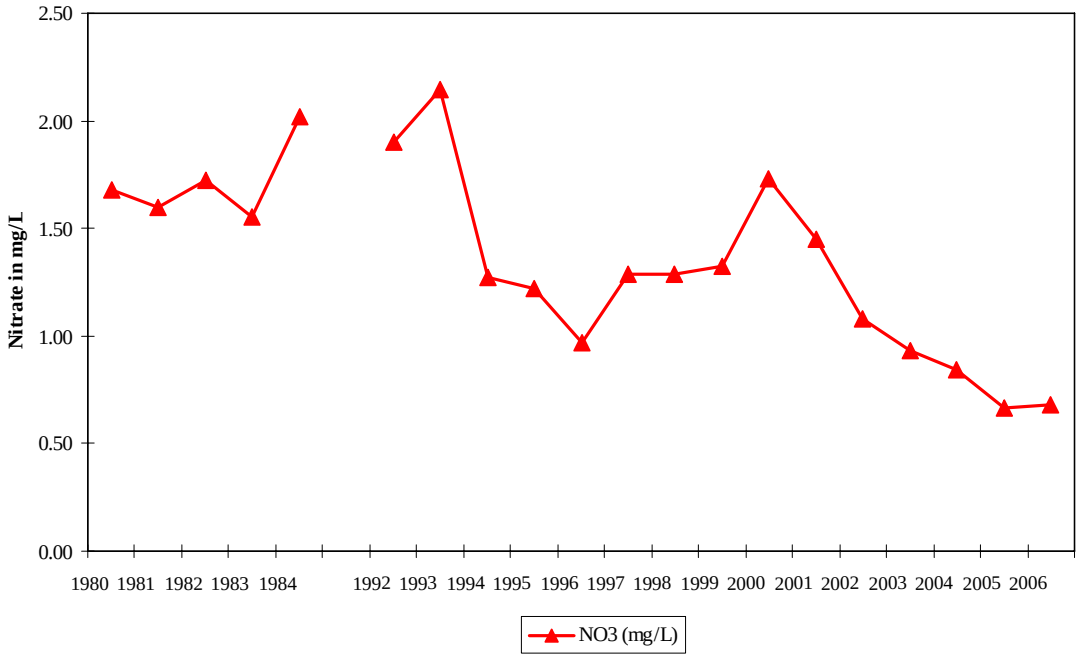
** D = samples analyzed by the Darrin Fresh Water Institute

APPENDIX V

Appendix V. NADP/NTN Huntington, NY nitrate volume-weighted concentrations compared with Cedar Lane nitrate volume-weighted concentration.

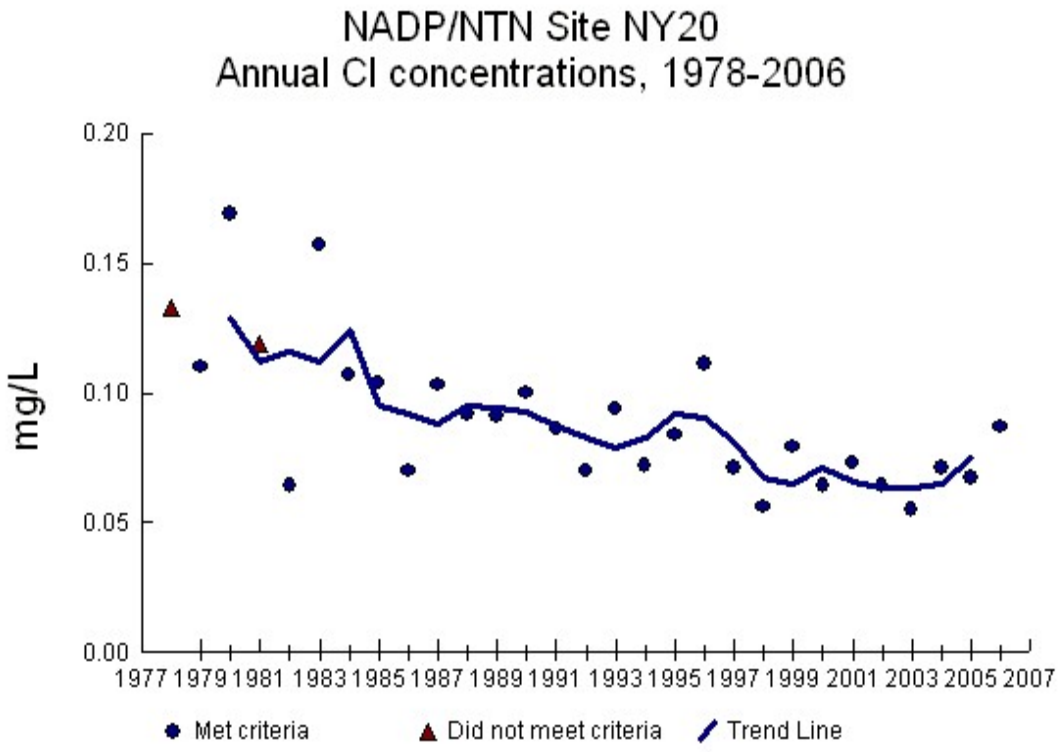


Cedar Lane volume-weighted concentrations of Nitrate
1980 through 2006

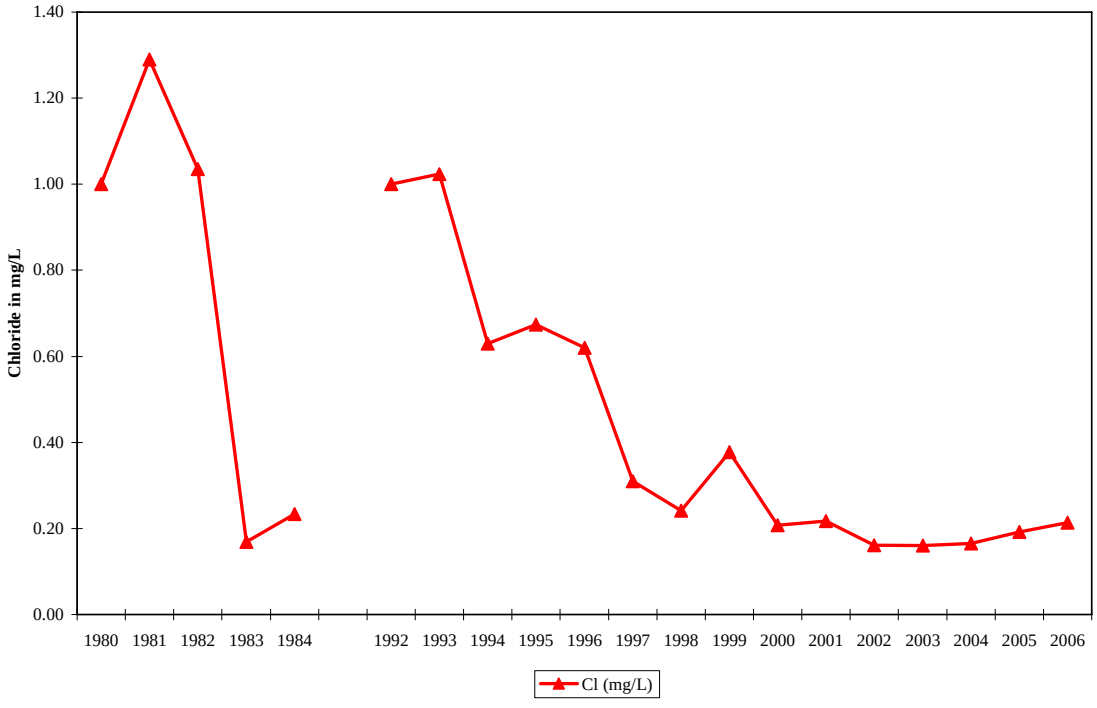


Appendix VI

Appendix VI. NADP/NTN Huntington, NY chloride volume-weighted concentrations compared with Cedar Lane chloride volume-weighted concentration.

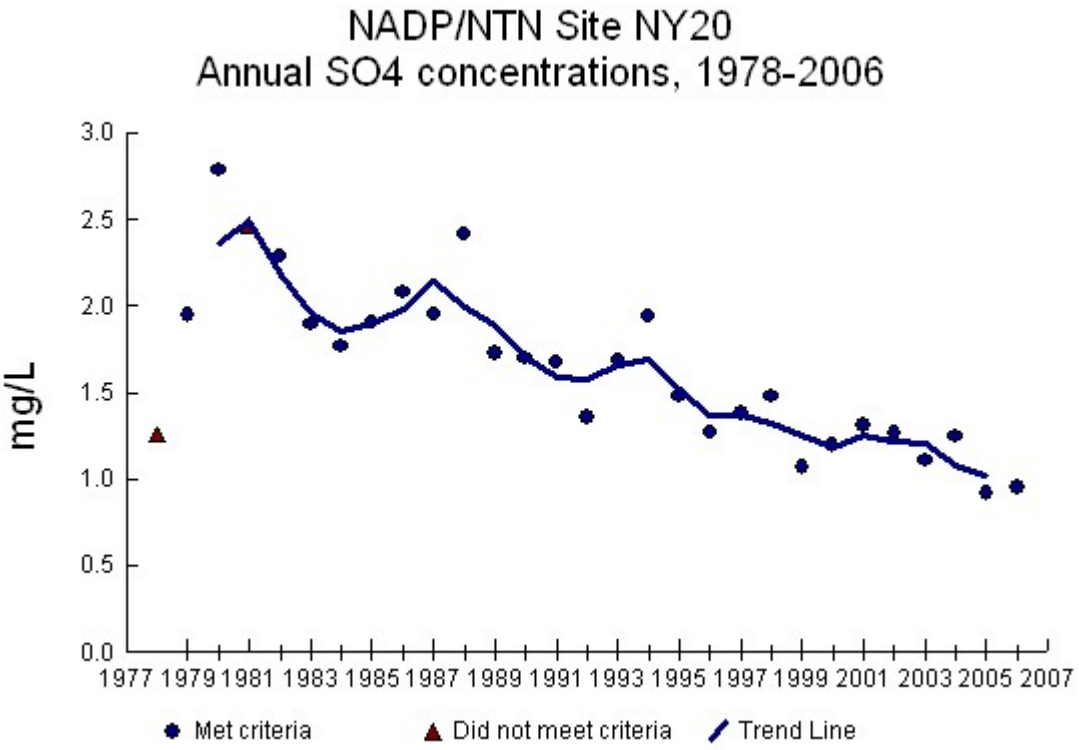


Cedar Lane volume-weighted concentrations of Chloride
1980 through 2006

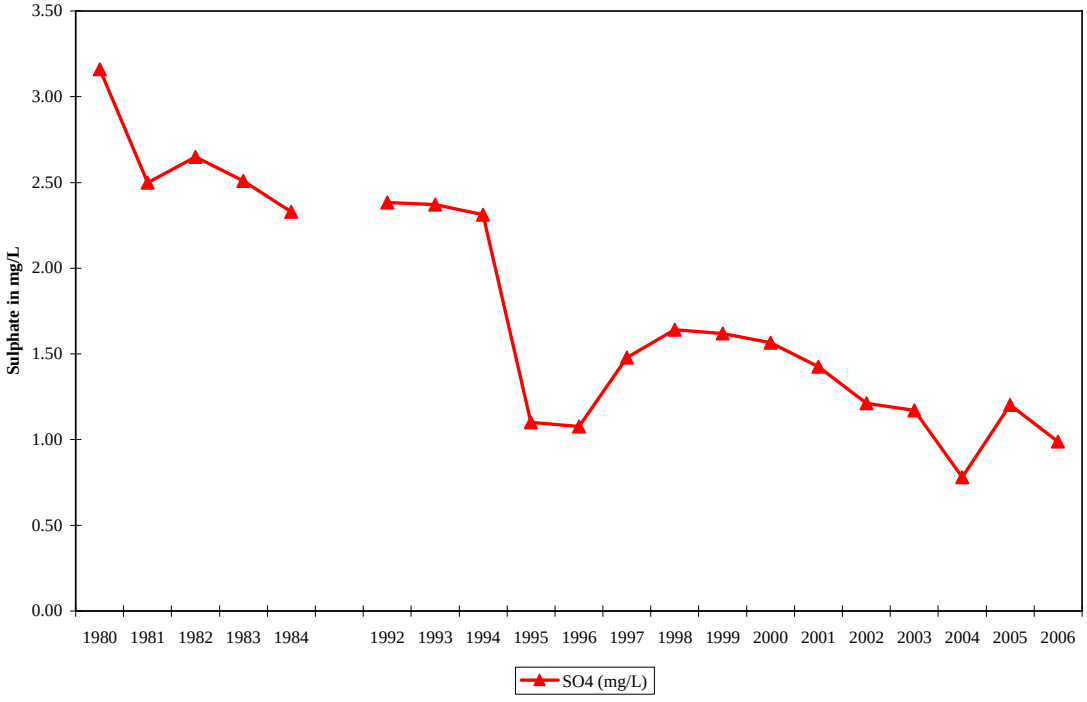


Appendix VII

Appendix VII. NADP/NTN Huntington, NY sulphate volume-weighted concentrations compared with Cedar Lane sulphate volume-weighted concentration.

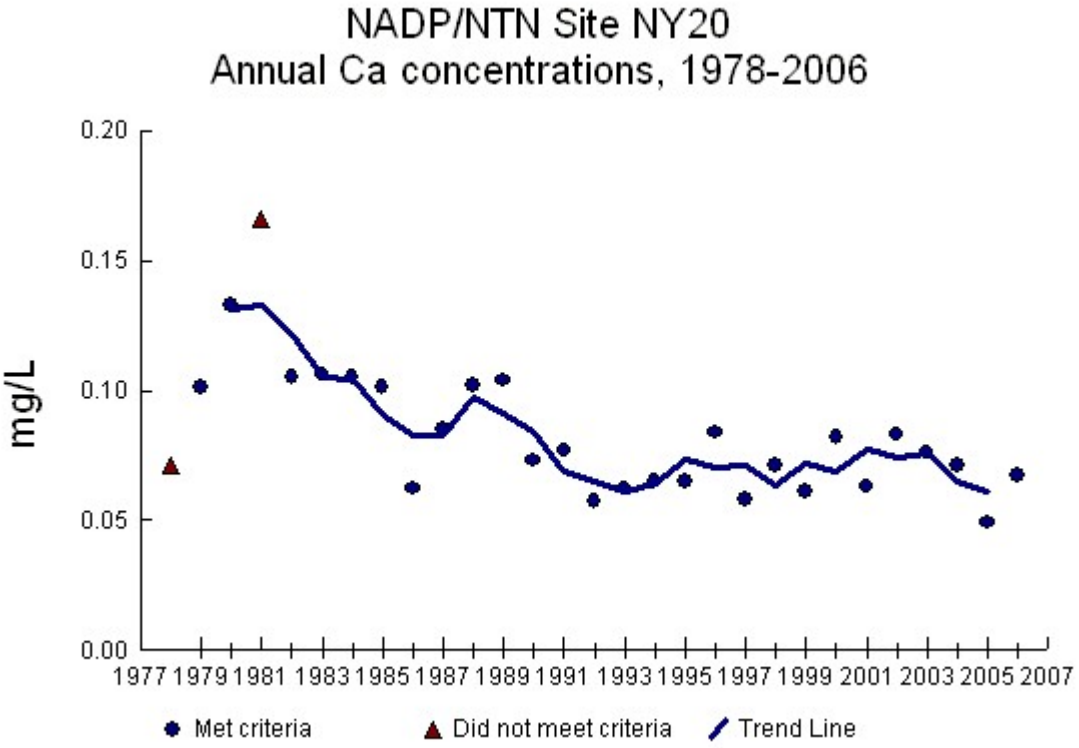


Cedar Lane volume-weighted concentrations of Sulfate
1980 through 2006

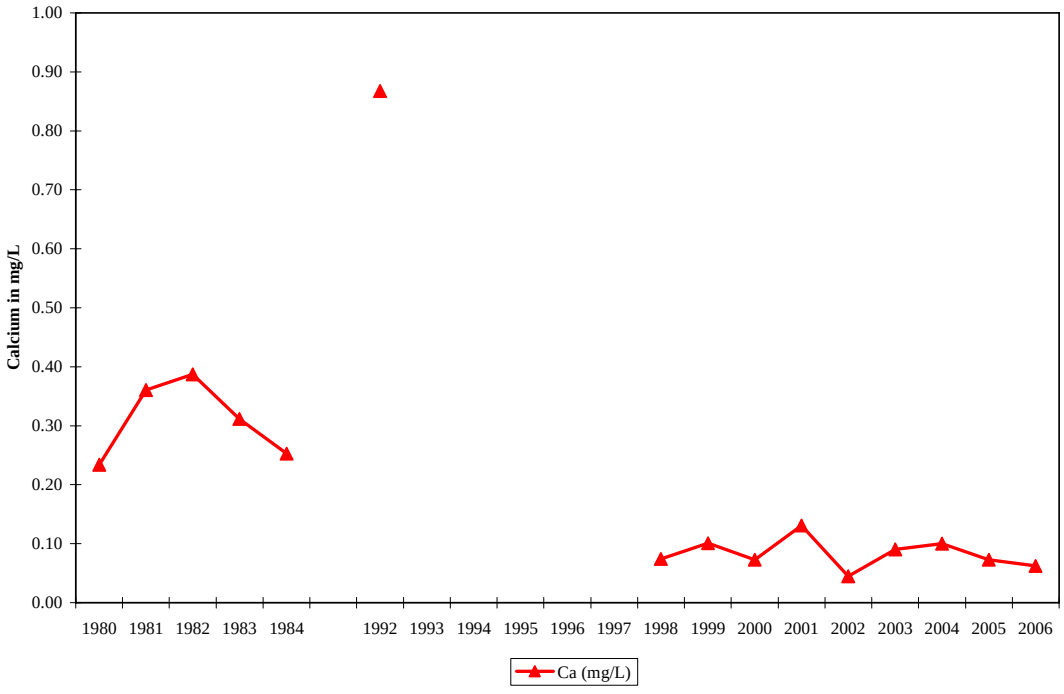


Appendix VIII

Appendix VIII. NADP/NTN Huntington, NY calcium volume-weighted concentrations compared with Cedar Lane calcium volume-weighted concentration.

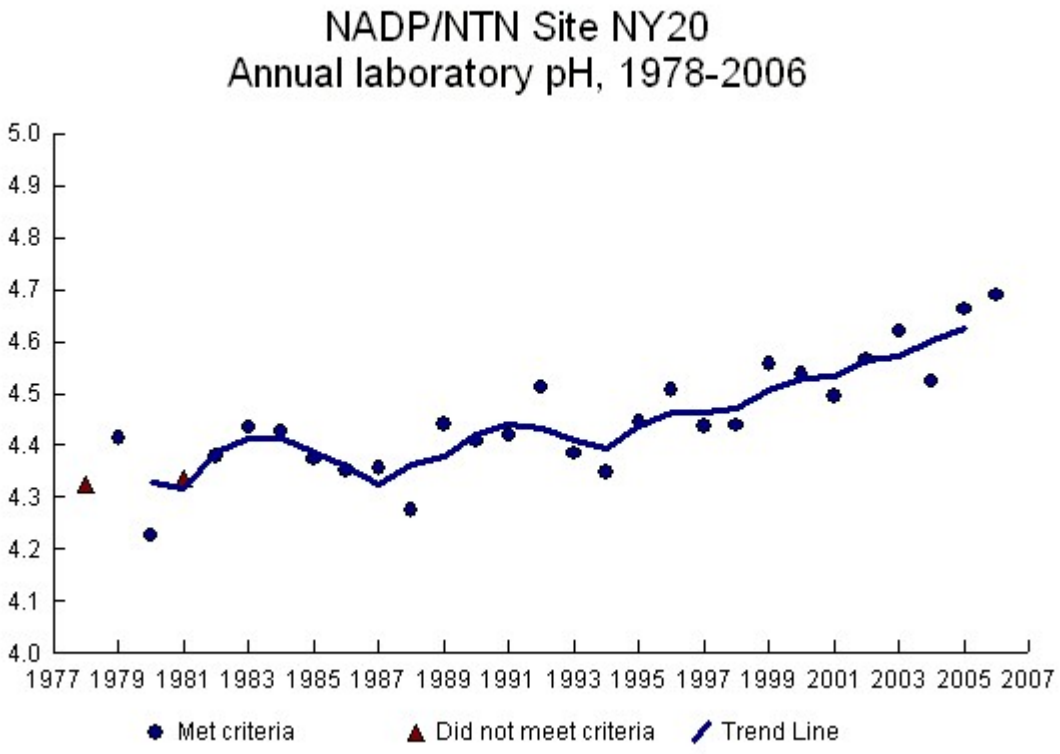


Cedar Lane volume-weighted concentrations of Calcium
1980 through 2006



Appendix IX

Appendix IX. NADP/NTN Huntington, NY pH volume-weighted concentrations compared with Cedar Lane pH volume-weighted concentration.



Cedar Lane volume-weighted concentrations of pH
1980 through 2006