

Annual Data Summary

**CRATERS OF THE MOON
NATIONAL MONUMENT**

1994

**National Park Service
Gaseous Air Pollutant Monitoring Network**



**AIR RESOURCES DIVISION
RESEARCH AND MONITORING BRANCH**

12795 West Alameda Parkway

P.O. Box 25287

Lakewood, Colorado 80225

Telephone: (303) 969-2820

Fax: (303) 969-2822

This Annual Data Summary was prepared under NPS Contract CX-1270-96-007 by:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, Colorado 80525
Telephone: (970) 484-7941
Fax: (970) 484-3423

For additional copies of this report or reports for other NPS units, contact:

National Park Service Air Resources Division
Information Management Center
c/o Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, Colorado 80525
Telephone: (970) 484-7941
Fax: (970) 484-3423
E-Mail: AIR-IMC@AIR-RESOURCE.COM

or

National Park Service
Air Resources Division
P.O. Box 25287
Lakewood, Colorado 80225-0287
Telephone: (303) 969-2130
E-Mail: AQ_INFO@AQD.NPS.GOV

ACKNOWLEDGEMENTS

The National Park Service Air Resources Division (ARD) recognizes the level of effort required by individual park units, site operators, auditors, cooperating state and local agencies, and ARD contractors. ARD sincerely appreciates the contributions of all participants in assisting with the collection, validation, and reporting of these air quality and meteorological data.

At Craters of the Moon National Monument, the ARD specifically recognizes Natalene Cummings for performing the technical and administrative skills required to help produce the data presented within this report.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 INTRODUCTION	1-1
1.1 The National Park Service Gaseous Pollutant Monitoring Network	1-1
1.2 Craters of the Moon National Monument	1-3
2.0 DATA SUMMARY	2-1
2.1 Overview	2-1
2.2 Ozone Data Summary	2-7
2.3 Meteorological Data Summary	2-23
3.0 NATIONAL PARK SERVICE AIR RESOURCES DIVISION DATA SOURCES	3-1
3.1 Guide to Attached Data Disks	3-1
3.2 Other Sources for Retrieving National Park Service Gaseous Pollutant Data	3-1
4.0 GLOSSARY	4-1
4.1 Definitions and Computational Procedures for National Park Service Quick Look Annual Summary Statistics Table	4-1
4.2 Air Quality Glossary	4-4

LIST OF FIGURES AND TABLES

	<u>Page</u>
Map of National Park Service Gaseous Pollutant Monitoring Network Ozone and Sulfur Dioxide Monitoring Sites	1-2
Site Specifications	1-4
Data Collection Statistics	2-2
First Quarter Data Stackplot	2-3
Second Quarter Data Stackplot	2-4
Third Quarter Data Stackplot	2-5
Fourth Quarter Data Stackplot	2-6

LIST OF FIGURES AND TABLES (CONTINUED)

	<u>Page</u>
Ozone Precision Check Data Summary	2-8
Ozone Quick Look Annual Summary Statistics	2-9
Ozone Annual Frequency Distribution	2-10
Ozone Standards Report and Maximum 1-Hour Concentrations	2-11
EPA Proposed Primary Ozone Standards Attainment Status	2-12
EPA Proposed Secondary Ozone Standards Attainment Status	2-13
Ten Highest Daily 1-Hour Average Ozone Concentrations	2-14
Episodes with 1-Hour Ozone Concentrations ≥ 100 ppb and > 124 ppb	2-15
Ozone Rank Listings of Second Highest 1-Hour Average Concentrations, Maximum 8-Hour Average Concentrations, and Annual Sum60 Exposure Index for All NPS Monitoring Sites	2-16
Ozone Three Year Comparison of Second Highest Concentrations	2-17
Map of National Park Service Gaseous Pollutant Monitoring Network, Second Highest 1-Hour Ozone Concentration	2-18
Quarterly Diurnal Ozone Plots	2-19
Annual Diurnal Ozone Plot	2-20
Quarterly Ozone Pollutant Roses	2-21
Annual Ozone Pollutant Rose	2-22
Summary of Selected Meteorological Data	2-24
Quarterly Wind Roses	2-25
Annual Wind Rose	2-26
Data Disk Contents	3-2
NPS IMC and AIRS Invalid Data Codes	3-3

1.0 INTRODUCTION

1.1 THE NATIONAL PARK SERVICE GASEOUS POLLUTANT MONITORING NETWORK

Gaseous air pollutants, including ozone and sulfur dioxide, are of concern to the National Park Service (NPS). Pollutants like these can affect park biological resources as well as the health of park residents and visitors. The NPS established a gaseous pollutant monitoring program for several pollutants linked to affects on NPS resources. This program was designed to meet certain resource management objectives.

The primary objective of this monitoring program is to establish the status and trends of park air quality conditions and to determine if a park is exceeding the National Ambient Air Quality Standards established by the U.S. Environmental Protection Agency (EPA) to protect public health and welfare. In addition, such monitoring is designed to detect changes or trends in pollution levels over time. A monitoring station may also be established if there is documented biological injury due to air pollution in a park unit. Information on ambient air pollution levels is an important part of research on affects of air pollutants on NPS resources, and can help confirm suspected causes of observed affects.

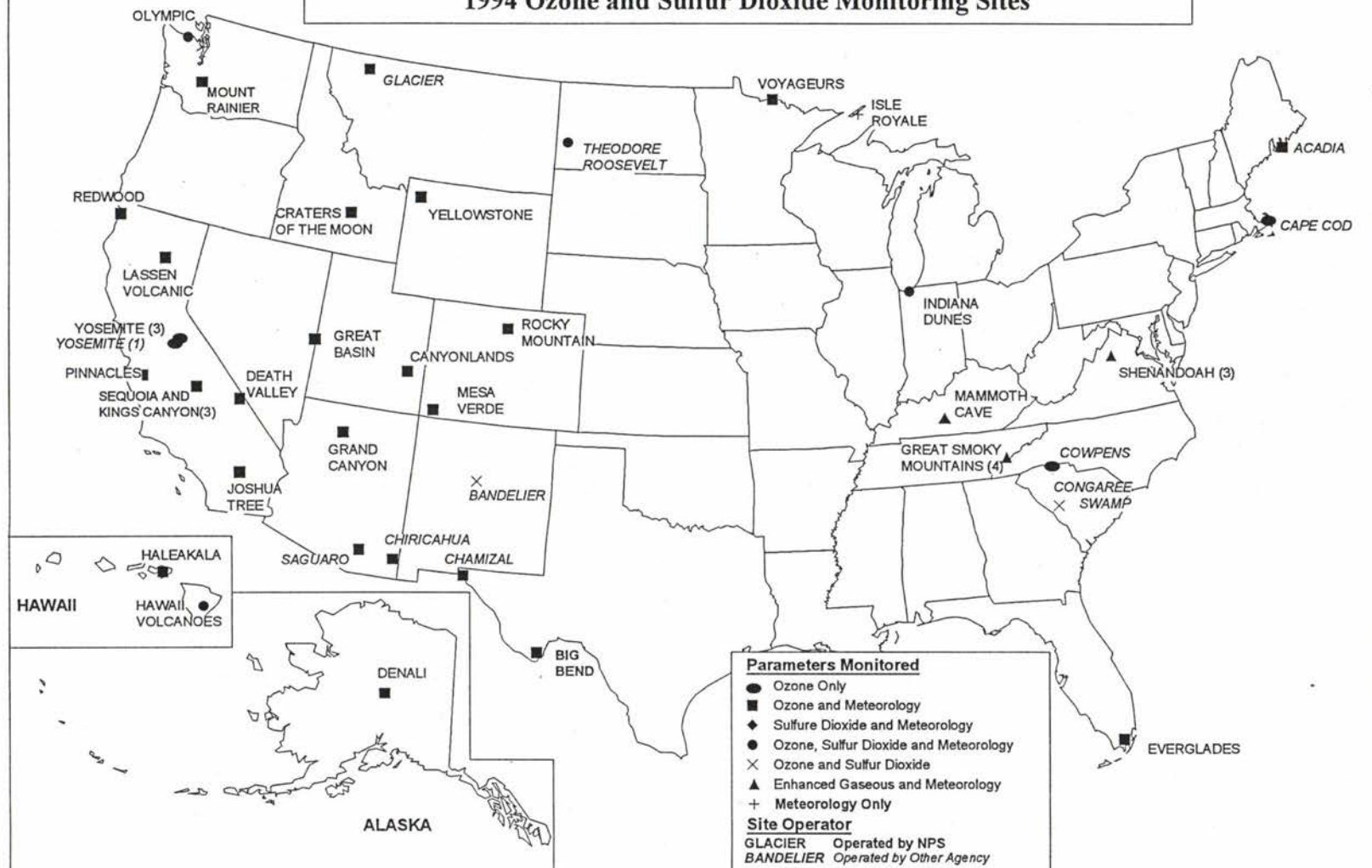
Other monitoring objectives call for the collection of data to support the National Park Service's required involvement in both the development of state air quality control plans, and the evaluation of permit applications for new or expanding air pollution sources wishing to locate near park units. The Clean Air Act gives federal land managers and superintendents an affirmative responsibility to protect air quality related values in Class I areas and to assess whether new sources will have an adverse impact on park resources and values. Information on air quality levels in NPS units can also be used to evaluate the performance of atmospheric models that simulate how pollutants are transported into parks and predict impacts on the park caused by air pollution sources.

The National Park Service Gaseous Pollutant Monitoring Network site locations and measured parameters collected in this reporting year are shown on the map on the following page. During this reporting period, 47 monitoring sites in 37 units of the National Park System had some combination of ozone, sulfur dioxide, and meteorological monitoring. Monitoring methods and quality assurance procedures used in the national park network meet the applicable 40 CFR Part 58 EPA requirements. This allows for the direct comparison of NPS collected data with that collected by the EPA, and state and local air pollution control agencies. Data collected by this network are incorporated in the EPA Aerometric Information Retrieval System (AIRS) database which is a national database of all air quality data collected throughout the country. These data are also stored in the NPS Air Resources Division's Information Management Center (IMC) that allows for easy access and analysis of data.

This report includes a variety of data summaries for data collected at an individual monitoring site at a national park during this reporting period. These summaries highlight the average range and frequency of the data collected during the year. A PC-compatible diskette containing a digital copy of all data collected during the year and data summary products included in this report is also included. Individual reports are generated for each site where monitoring was conducted in the national park network.

NATIONAL PARK SERVICE GASEOUS POLLUTANT MONITORING NETWORK

1994 Ozone and Sulfur Dioxide Monitoring Sites



1.2 CRATERS OF THE MOON NATIONAL MONUMENT

Craters of the Moon National Monument, a Class I area, is located in southern Idaho about 60 miles northwest of Pocatello. Its location and site specifications are presented on the following page.

Craters of the Moon National Monument was established by presidential proclamation in 1924. It occupies approximately 54,000 acres in the eastern Snake River Plain, which crosses southern Idaho as a broad arc of low topographic relief, contrasting with the mountainous terrain of the rest of the state.

The significance of the monument is the relatively young age of the lava flows and the diversity of volcanic features in a small geographic area. The monument contains part of one of the four rift sets that make up the Great Rift, a volcanic rift zone that extends for 60 miles from the Pioneer Mountains south nearly to the Snake River. Visitors to the monument can see some of the most spectacular and diverse features along the Great Rift, including vast basaltic lava flows and associated volcanic products from eruptions that occurred between 15,000 and 2,100 years ago. Features include two types of lava flow, cinder cones, rafted blocks, fissure cracks, vents, spatter cones, lava tubes, and tree molds.

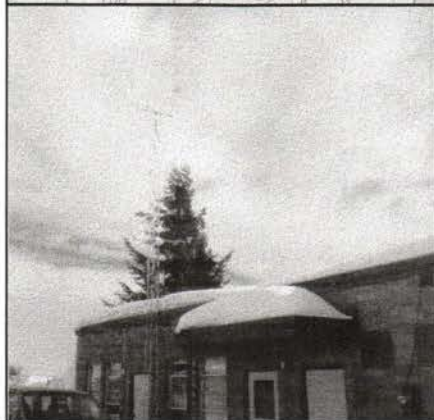
The monument's fauna and particularly its flora reflect the influence of the geologic setting. Plant succession is well illustrated among the different aged lava flows. Limber pine grows at a lower altitude in the monument than throughout the rest of its range. Three subspecies of small mammals were first described from this area and are found only in the vicinity of lava flows of the Great Rift.

The northern end of the monument includes a small portion of the foothills of the Pioneer Mountains. The north unit (4,125 acres) is a different environment from the volcanic area to the south: it is a sagebrush-grassland shrub steppe with stands of Douglas-fir and quaking aspen. Riparian areas surround the small watercourses that arise from springs in the foothills.

Approximately 81 percent of the monument (43,243 acres) was designated wilderness on October 23, 1970. This wilderness area was designated a Class I area in the Clean Air Act, as amended in 1977. The rest of the monument is designated as a class II area, however, the entire monument is managed as a class I area.

Visibility and scenery are notable air quality related values at Craters of the Moon.

Ozone Monitoring
NPS Gaseous Air Pollutant Monitoring Network



1-4

2.0 DATA SUMMARY

2.1 OVERVIEW

Based on the site specifications during this annual reporting period, data summaries and statistics are provided in this section.

Data Collection Statistics
Craters of the Moon National Monument

Final Data

01/01/94 - 12/31/94

Parameter	Par Code	Data Recovery			Valid Data	
		No. Possible	No. Collected	% Collected	No. Valid	% Valid
Ozone Analyzer	O3	8760	8283	94.6	8167	93.2
Ozone Additional Analyzer	O3ADD	8683	8200	94.4	8200	94.4
Scalar Wind Speed	SWS	8760	8701	99.3	8701	99.3
Vector Wind Speed	VWS	8760	8701	99.3	8701	99.3
Vector Wind Direction	VWD	8760	8701	99.3	8701	99.3
Ambient Temperature (aspirated)	TMP	8760	8701	99.3	8701	99.3
* Dew Point	DPT	8760	8701	99.3		
* Relative Humidity - calculated	RHC	8701	8701	100.0		
Solar Radiation	SOL	8760	8701	99.3	8699	99.3

Notes: All statistics are for hourly averages.

The number collected does not include normal maintenance or events beyond the control of the network.

The percent valid is calculated against the number possible.

Automatic zeros and spans are performed daily on most ambient gas analyzers, therefore, no ambient data can be collected during this time. As a result, the maximum percent valid for ambient gas data typically can not be greater than 95.8.

NPS Performance Goals:

Quarterly Criteria:

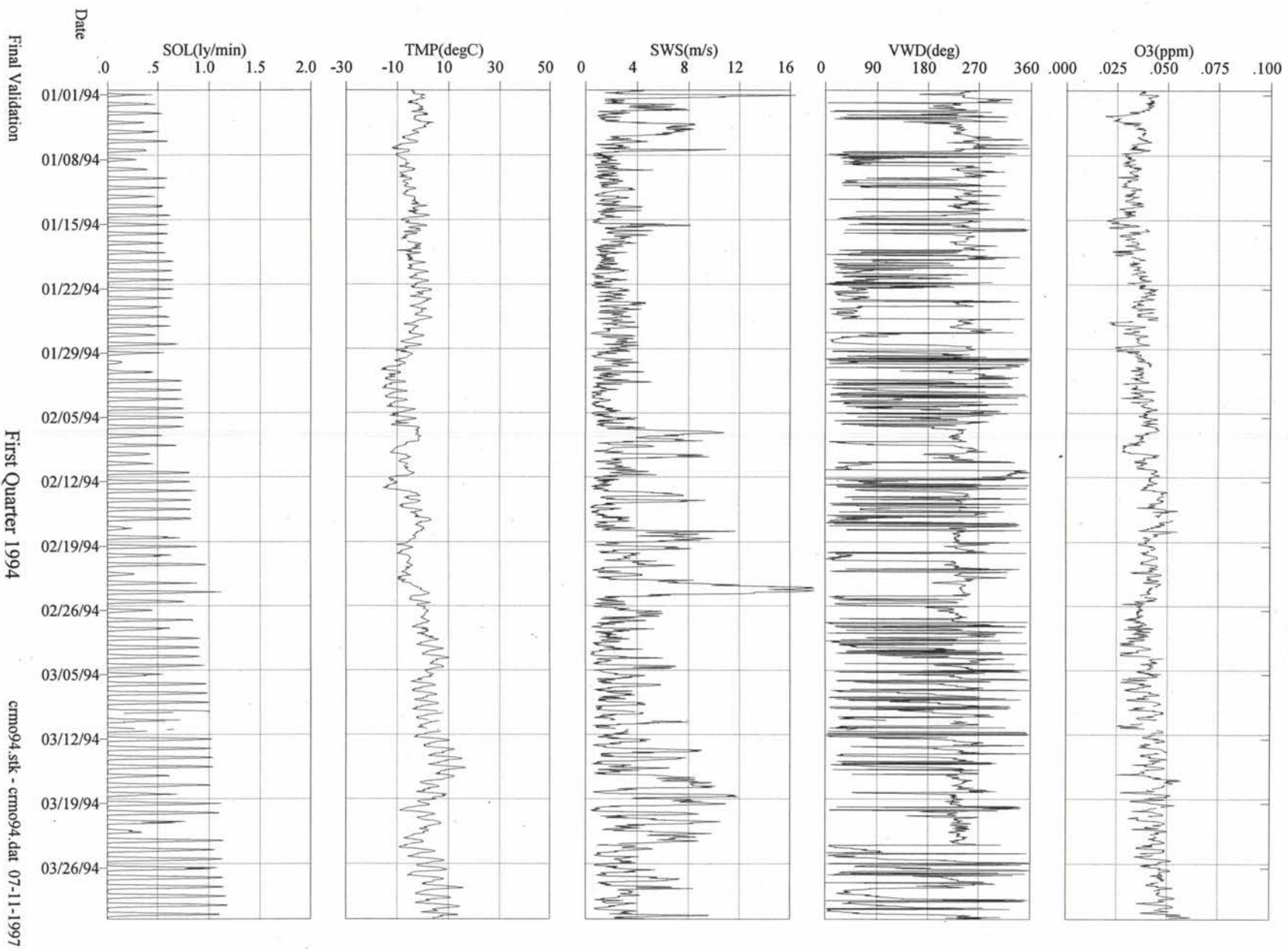
100% of sites, >= 85% valid data capture
90% of sites, >= 90% valid data capture
80% of sites, >= 95% valid data capture

Monthly Criteria:

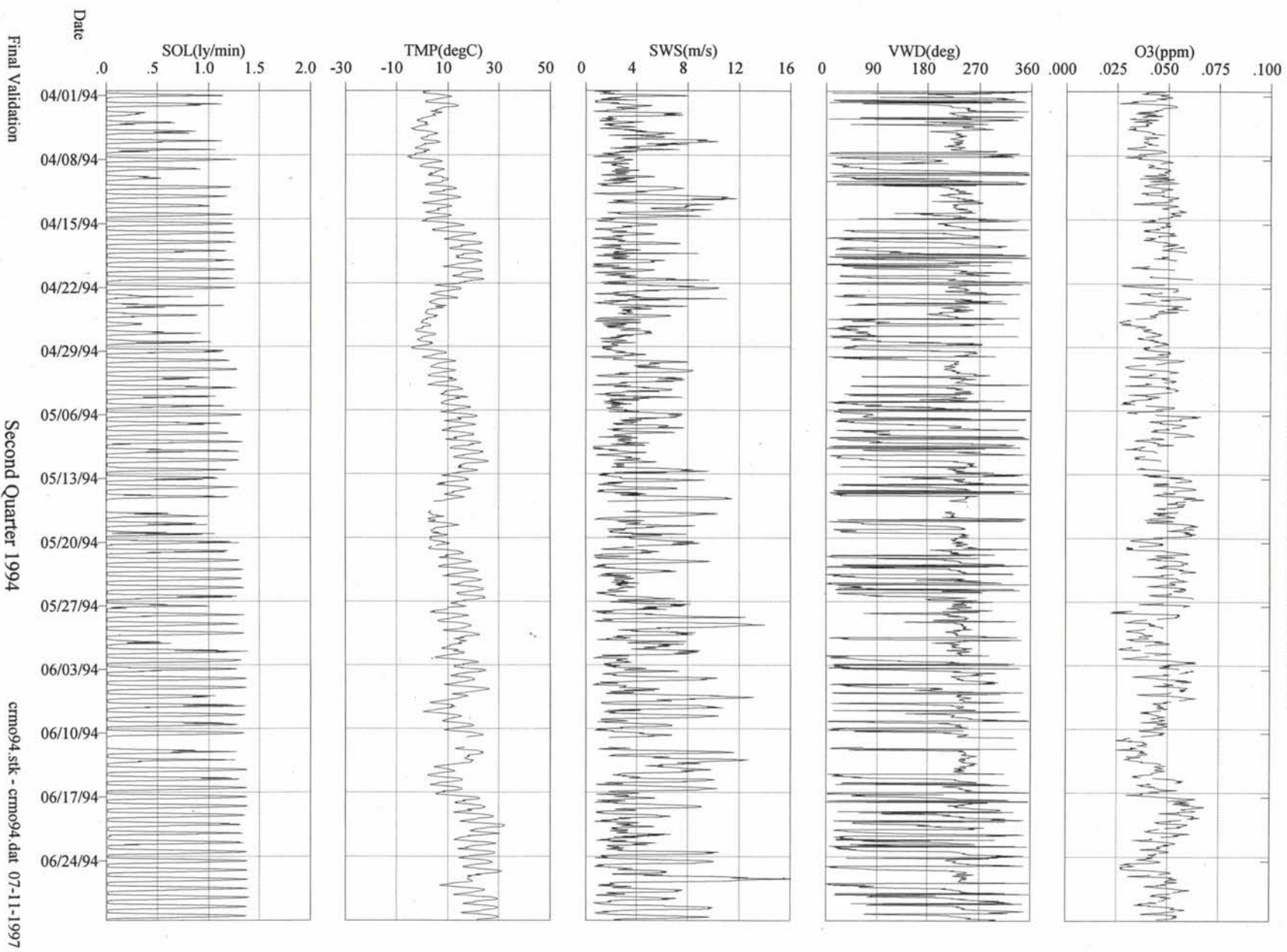
100% of sites, >= 60% valid data capture
90% of sites, >= 75% valid data capture
80% of sites, >= 85% valid data capture

* The validity of dew point and calculated relative humidity data is currently under investigation.

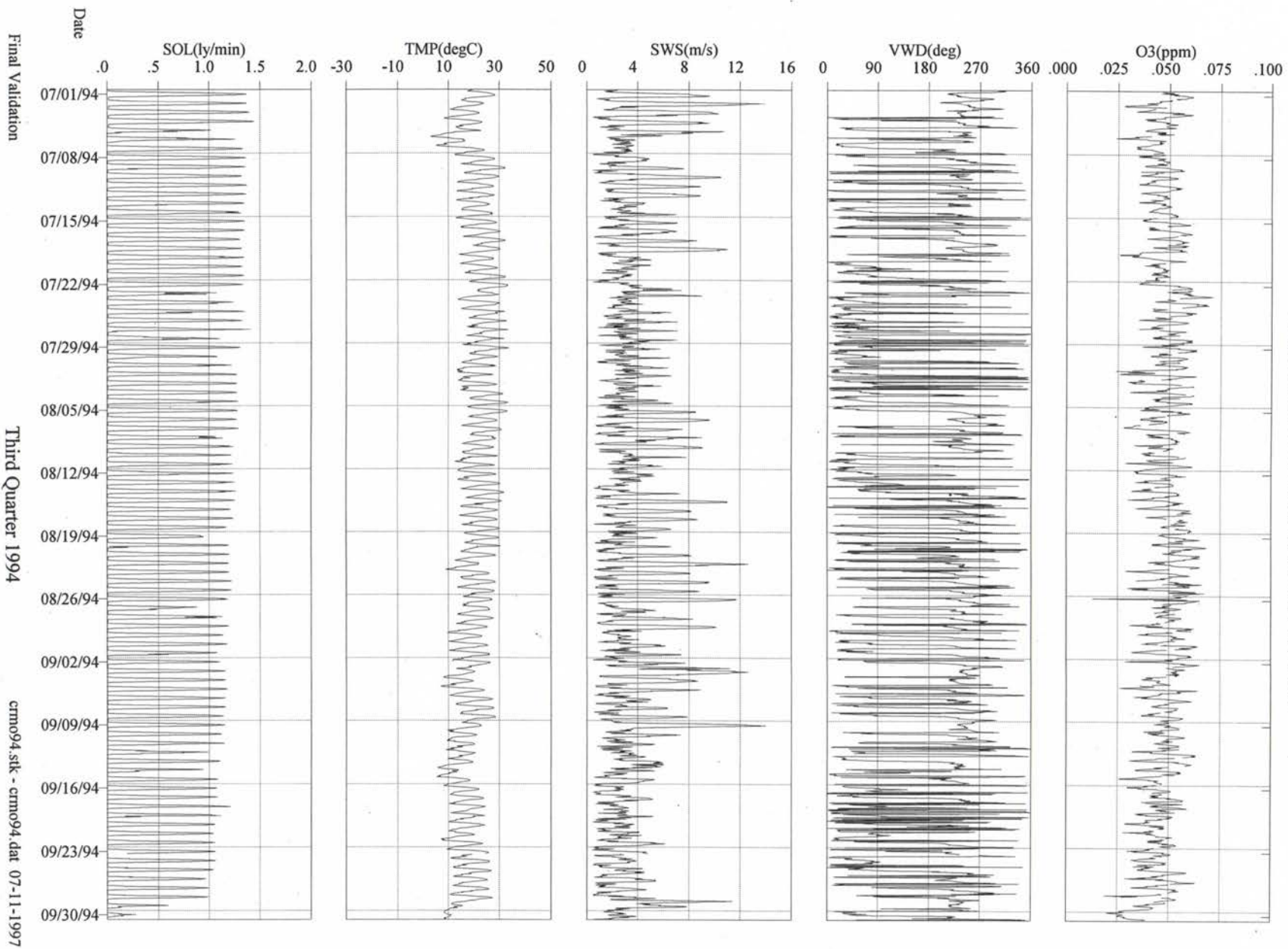
Craters of the Moon National Monument



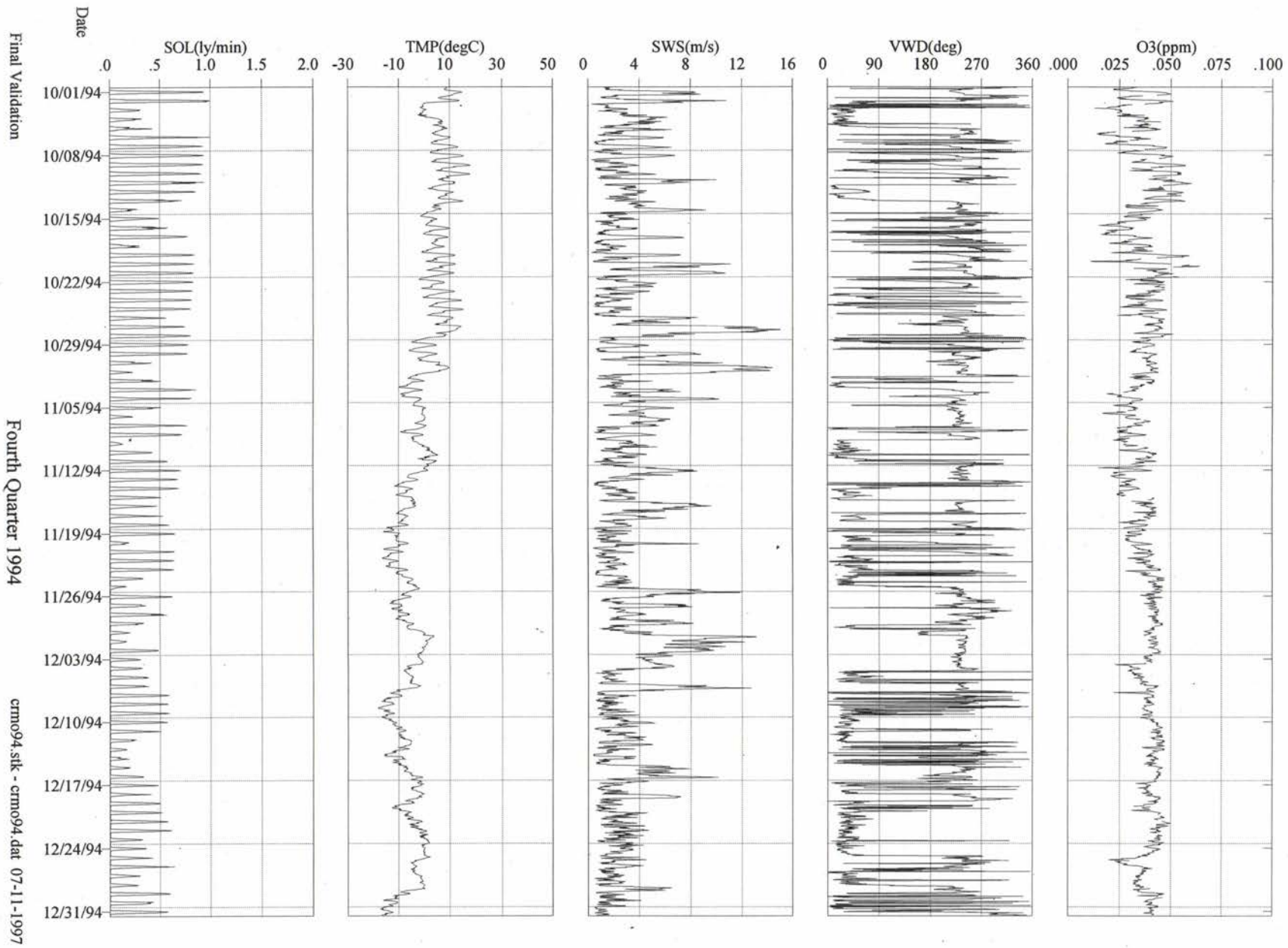
Craters of the Moon National Monument



Craters of the Moon National Monument



Craters of the Moon National Monument



2.2 OZONE DATA SUMMARY

Ozone Precision Check Summary Craters of the Moon National Monument

Precision checks are required by the Environmental Protection Agency (EPA) of all monitoring instruments collecting data which are to be submitted to the EPA Aerometric Information Retrieval System (AIRS). A precision check is performed by challenging the pollutant analyzer with a known concentration of gas (between 0.08 and 0.10 ppm for ozone and sulfur dioxide) from the pollutant transfer standard. This precision check must be performed at least every 14 days of monitoring operation. The percent difference between the analyzer and the transfer standard is then calculated.¹ According to NPS Standard Operating Procedures, the pollutant analyzer must respond within 10% of the transfer standard. The table below gives the number of precision checks performed during each quarter, the average² of all the individual precision check percent differences for the quarter, and the upper and lower 95% probability limits³ for precision checks. The probability limits represent the interval having a 95% chance of containing the true average percent difference. The quarterly average percent difference and probability limits should ideally be within +/- 10%.

Final Data 01/01/94 - 12/31/94				
Calendar Quarter	Number of Precision Checks	Average Percent Difference ^{1,2}	Lower 95% Probability Limit ³	Upper 95% Probability Limit ³
1	27	-2.78	-6.32	0.76
2	20	0.11	-3.03	3.26
3	24	1.66	-2.15	5.46
4	19	-2.51	-8.23	3.21

¹ Percent Difference = $\frac{\text{analyzer} - \text{transfer std}}{\text{transfer std}} \times 100$.

² Average Percent Difference is the mean of all individual precision check percent differences during the quarter.

³ Upper/Lower 95% Probability Limits = (Average Percent Difference) +/- (1.96)(Standard Deviation of precision check percent differences in the quarter.)

Ozone Precision Check Summary Craters of the Moon National Monument

Precision checks are required by the Environmental Protection Agency (EPA) of all monitoring instruments collecting data which are to be submitted to the EPA Aerometric Information Retrieval System (AIRS). A precision check is performed by challenging the pollutant analyzer with a known concentration of gas (between 0.08 and 0.10 ppm for ozone and sulfur dioxide) from the pollutant transfer standard. This precision check must be performed at least every 14 days of monitoring operation. The percent difference between the analyzer and the transfer standard is then calculated.¹ According to NPS Standard Operating Procedures, the pollutant analyzer must respond within 10% of the transfer standard. The table below gives the number of precision checks performed during each quarter, the average² of all the individual precision check percent differences for the quarter, and the upper and lower 95% probability limits³ for precision checks. The probability limits represent the interval having a 95% chance of containing the true average percent difference. The quarterly average percent difference and probability limits should ideally be within +/- 10%.

Final Data 01/01/94 - 12/31/94				
Calendar Quarter	Number of Precision Checks	Average Percent Difference ^{1,2}	Lower 95% Probability Limit ³	Upper 95% Probability Limit ³
1	27	-2.78	-6.32	0.76
2	20	0.11	-3.03	3.26
3	24	1.66	-2.15	5.46
4	19	-2.51	-8.23	3.21

¹ Percent Difference = $\frac{\text{analyzer} - \text{transfer std}}{\text{transfer std}} \times 100$.

² Average Percent Difference is the mean of all individual precision check percent differences during the quarter.

³ Upper/Lower 95% Probability Limits = (Average Percent Difference) +/- (1.96)(Standard Deviation of precision check percent differences in the quarter.)

Ozone Precision Check Summary

Craters of the Moon National Monument

Precision checks are required by the Environmental Protection Agency (EPA) of all monitoring instruments collecting data which are to be submitted to the EPA Aerometric Information Retrieval System (AIRS). A precision check is performed by challenging the pollutant analyzer with a known concentration of gas (between 0.08 and 0.10 ppm for ozone and sulfur dioxide) from the pollutant transfer standard. This precision check must be performed at least every 14 days of monitoring operation. The percent difference between the analyzer and the transfer standard is then calculated.¹ According to NPS Standard Operating Procedures, the pollutant analyzer must respond within 10% of the transfer standard. The table below gives the number of precision checks performed during each quarter, the average² of all the individual precision check percent differences for the quarter, and the upper and lower 95% probability limits³ for precision checks. The probability limits represent the interval having a 95% chance of containing the true average percent difference. The quarterly average percent difference and probability limits should ideally be within +/- 10%.

Final Data 01/01/94 - 12/31/94				
Calendar Quarter	Number of Precision Checks	Average Percent Difference ^{1,2}	Lower 95% Probability Limit ³	Upper 95% Probability Limit ³
1	27	-2.78	-6.32	0.76
2	20	0.11	-3.03	3.26
3	24	1.66	-2.15	5.46
4	19	-2.51	-8.23	3.21

¹ Percent Difference = $\frac{\text{analyzer} - \text{transfer std}}{\text{transfer std}} \times 100$.

² Average Percent Difference is the mean of all individual precision check percent differences during the quarter.

³ Upper/Lower 95% Probability Limits = (Average Percent Difference) +/- (1.96)(Standard Deviation of precision check percent differences in the quarter.)

Ozone Precision Check Summary Craters of the Moon National Monument

Precision checks are required by the Environmental Protection Agency (EPA) of all monitoring instruments collecting data which are to be submitted to the EPA Aerometric Information Retrieval System (AIRS). A precision check is performed by challenging the pollutant analyzer with a known concentration of gas (between 0.08 and 0.10 ppm for ozone and sulfur dioxide) from the pollutant transfer standard. This precision check must be performed at least every 14 days of monitoring operation. The percent difference between the analyzer and the transfer standard is then calculated.¹ According to NPS Standard Operating Procedures, the pollutant analyzer must respond within 10% of the transfer standard. The table below gives the number of precision checks performed during each quarter, the average² of all the individual precision check percent differences for the quarter, and the upper and lower 95% probability limits³ for precision checks. The probability limits represent the interval having a 95% chance of containing the true average percent difference. The quarterly average percent difference and probability limits should ideally be within +/- 10%.

Final Data 01/01/94 - 12/31/94				
Calendar Quarter	Number of Precision Checks	Average Percent Difference ^{1,2}	Lower 95% Probability Limit ³	Upper 95% Probability Limit ³
1	27	2.89	-0.86	6.65
2	20	-0.09	-3.23	3.05
3	24	-1.60	-5.30	2.11
4	19	2.66	-3.29	8.62

¹ Percent Difference = $\frac{\text{analyzer} - \text{transfer std}}{\text{transfer std}} \times 100$.

² Average Percent Difference is the mean of all individual precision check percent differences during the quarter.

³ Upper/Lower 95% Probability Limits = (Average Percent Difference) +/- (1.96)(Standard Deviation of precision check percent differences in the quarter.)

Ozone Quick Look Annual Summary Statistics
Craters of the Moon National Monument
01/01/94 - 12/31/94

STATISTIC*	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MAY- SEP	ANNUAL
DAILY 1-HR MAXIMUM	45	55	62	62	68	68	71	68	65	64	47	50	71	71
NO. OF DAYS	(31)	(28)	(31)	(30)	(31)	(30)	(31)	(31)	(30)	(31)	(30)	(31)	(153)	(365)
AVERAGE DAILY MAXIMUM	40	45	50	53	57	55	57	60	55	48	41	44	57	50
NO. OF DAYS	(31)	(28)	(31)	(30)	(31)	(30)	(31)	(31)	(30)	(31)	(30)	(31)	(153)	(365)
MAXIMUM DAILY MEAN	42	46	50	53	58	60	59	57	53	50	44	46	60	60
NO. OF DAYS	(31)	(27)	(30)	(26)	(26)	(30)	(31)	(31)	(30)	(31)	(30)	(31)	(148)	(354)
AVERAGE DAILY MEAN	34	40	43	44	48	47	48	49	46	38	35	40	47	43
NO. OF DAYS	(31)	(27)	(30)	(26)	(26)	(30)	(31)	(31)	(30)	(31)	(30)	(31)	(148)	(354)
MAX PEAK:MIN RATIO	2.158	1.643	2.240	2.077	2.545	2.286	2.458	5.000	2.842	5.818	2.733	2.050	5.000	5.818
NO. OF DAYS	(31)	(27)	(30)	(26)	(26)	(30)	(31)	(31)	(30)	(31)	(30)	(31)	(148)	(354)
AVERAGE PEAK:MIN RATIO	1.429	1.336	1.518	1.558	1.673	1.593	1.592	1.831	1.732	2.022	1.510	1.302	1.685	1.593
NO. OF DAYS	(31)	(27)	(30)	(26)	(26)	(30)	(31)	(31)	(30)	(31)	(30)	(31)	(148)	(354)
MAX 9AM-4PM AVERAGE	42	49	52	56	61	64	64	61	57	54	44	44	64	64
NO. OF DAYS	(30)	(27)	(27)	(27)	(29)	(29)	(31)	(30)	(30)	(31)	(28)	(30)	(149)	(349)
MONTHLY 9AM-4PM AVERAGE	36	41	45	47	51	50	52	53	49	42	37	40	51	45
NO. OF DAYS	(30)	(27)	(27)	(27)	(29)	(29)	(31)	(30)	(30)	(31)	(28)	(30)	(149)	(349)
MAX 7AM-7PM AVERAGE	41	47	51	54	61	63	63	60	56	54	45	46	63	63
NO. OF DAYS	(31)	(27)	(30)	(26)	(28)	(29)	(31)	(31)	(30)	(31)	(29)	(31)	(149)	(354)
MONTHLY 7AM-7PM AVERAGE	35	40	44	46	51	49	51	52	48	40	36	40	50	44
NO. OF DAYS	(31)	(27)	(30)	(26)	(28)	(29)	(31)	(31)	(30)	(31)	(29)	(31)	(149)	(354)
MONTHLY MEAN	34	40	42	45	47	47	48	49	46	38	35	40	47	43
NO. OF DAYS	(704)	(633)	(694)	(636)	(650)	(678)	(706)	(700)	(683)	(699)	(678)	(706)	(3417)	(8167)
SUM0 EXPOSURE INDEX	24227	25488	29447	28350	30859	31601	33927	34300	31215	26409	24004	28135	161902	347962
NO. OF DAYS	(704)	(633)	(694)	(636)	(650)	(678)	(706)	(700)	(683)	(699)	(678)	(706)	(3417)	(8167)
SUM60 EXPOSURE INDEX	.	.	122	365	3907	3297	3052	4523	1354	186	.	.	16133	16806
NO. OF DAYS	(0)	(0)	(2)	(6)	(63)	(53)	(49)	(73)	(22)	(3)	(0)	(0)	(260)	(271)
SUM80 EXPOSURE INDEX	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NO. OF DAYS	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
W126 EXPOSURE INDEX	528	1118	1827	2468	4441	4061	4532	5161	3351	1448	668	1122	21545	30724
NO. OF DAYS	(704)	(633)	(694)	(636)	(650)	(678)	(706)	(700)	(683)	(699)	(678)	(706)	(3417)	(8167)
Concentrations in parts per billion (ppb)														
Exposures in parts per billion-hours (ppb-hr)														
* Statistics defined in Section 4.1 Glossary														

Ozone Annual Frequency Distribution
Craters of the Moon National Monument

01/01/94 - 12/31/94

% Obs	# Obs	Min. Obs.	Percentile							Max. Obs.	2nd Max.	Arith. Mean	Geometric	
			10	30	50	70	90	95	99				Mean	Std. Dev.
95	4752	.028	.046	.051	.055	.060	.064	.065	.068	.071	.069	.0551	.0546	1.15

Concentrations in parts per million (ppm).

Notes: 1 % Obs. is the percent of # valid observations / # possible observations during the AIRS Monitoring Season.
 2 # Obs. is the total possible observations during the AIRS Monitoring Season.
 3 Min. Obs. is the minimum daily maximum recorded during the AIRS Monitoring Season.
 4 The data selected for the remainder of the table is determined by the AIRS Monitoring Season as defined in the AIRS Geo-Common file for the state in which the site resides.

Ozone Standards Report and
Daily Maximum 1-Hour Concentrations (ppm)
Craters of the Moon National Monument

01/01/94 - 12/31/94

Day	Jan-94		Feb-94		Mar-94		Apr-94		May-94		Jun-94		Jul-94		Aug-94		Sep-94		Oct-94		Nov-94		Dec-94	
1	.045	S	.041	T	.041	T	.052	F	.055	S		W	.061	F	.063	M	.061	T	.050	S	.044	T	.044	T
2	.043	S	.044	W	.042	W	.054	S	.054	M	.064	T	.051	S	.062	T	.065	F	.051	S	.042	W	.045	F
3	.041	M	.043	T	.048	T	.047	S	.055	T	.063	F	.061	S	.062	W	.058	S	.028	M	.037	T	.041	S
4	.037	T	.045	F	.045	F	.045	M	.050	W	.062	S	.054	M	.061	T	.051	S	.045	T	.036	F	.038	S
5	.039	W	.045	S	.047	S	.048	T	.053	T	.060	S	.053	T	.060	F	.064	M	.045	W	.034	S	.037	M
6	.042	T	.046	S	.042	S	.045	W	.066	F	.064	M	.048	W	.049	S	.061	T	.040	T	.037	S	.044	T
7	.041	F	.044	M	.046	M	.049	T	.059	S	.050	T	.047	T	.060	S	.055	W	.048	F	.040	M	.042	W
8	.034	S	.039	T	.047	T	.052	F	.063	S	.049	W	.050	F	.055	M	.057	T	.051	S	.038	T	.042	T
9	.037	S	.046	W	.048	W	.051	S	.053	M	.050	T	.057	S	.054	T	.055	F	.057	S		W	.041	F
10	.036	M	.040	T		T	.055	S		T	.049	F	.054	S	.058	W	.058	S	.055	M	.043	T	.044	S
11	.037	T	.046	F	.048	F	.054	M		W	.040	S	.056	M	.061	T	.055	S	.060	T	.043	F	.046	S
12	.036	W	.045	S	.049	S	.055	T		T	.040	S	.050	T	.058	F	.063	M	.056	W	.041	S	.047	M
13	.038	T	.050	S	.050	S	.055	W	.062	F	.049	M	.051	W	.052	S	.061	T	.057	T	.033	S	.047	T
14	.034	F	.048	M	.050	M	.059	T	.064	S	.049	T	.054	T	.055	S	.056	W	.046	F	.035	M	.044	W
15	.040	S	.055	T	.049	T	.051	F	.068	S	.058	W	.060	F	.057	M	.047	T	.040	S	.042	T	.046	T
16	.041	S		W	.056	W	.054	S	.059	M	.055	T	.061	S	.061	T	.051	F	.032	S	.043	W	.045	F
17	.036	M	.055	T	.057	T	.056	S	.055	T	.064	F	.059	S	.059	W	.057	S	.041	M	.043	T	.043	S
18	.039	T	.050	F	.052	F		M	.065	W	.068	S	.059	M	.061	T	.059	S	.041	T	.039	F	.045	S
19	.039	W	.044	S	.054	S		T	.064	T	.066	S	.058	T	.065	F	.053	M	.059	W	.038	S	.045	M
20	.039	T	.045	S	.048	S		W	.048	F	.060	M	.050	W	.068	S	.048	T	.064	T	.041	S	.046	T
21	.042	F	.045	M	.049	M		T	.061	S	.061	T	.050	T	.065	S	.052	W	.051	F	.042	M	.050	W
22	.045	S	.047	T	.050	T	.055	F	.060	S	.054	W	.061	F	.065	M	.054	T	.054	S	.040	T	.049	T
23	.044	S	.047	W	.049	W	.061	S	.064	M	.051	T	.071	S	.060	T	.051	F	.047	S	.045	W	.047	F
24	.044	M	.043	T	.049	T	.060	S	.060	T	.047	F	.069	S	.066	W	.049	S	.046	M	.047	T	.045	S
25	.045	T	.045	F	.052	F	.055	M	.059	W	.052	S	.063	M	.067	T	.059	S	.048	T	.046	F	.041	S
26	.039	W	.038	S	.052	S	.039	T		T	.055	S	.059	T	.065	F	.063	M	.047	W	.046	S	.041	M
27	.040	T	.039	S	.049	S	.047	W		F	.061	M	.058	W	.056	S	.055	T	.046	T	.043	S	.038	T
28	.041	F	.043	M	.053	M	.050	T	.056	S	.052	T	.061	T	.056	S	.054	W	.051	F	.044	M	.040	W
29	.037	S			.054	T	.051	F	.048	S	.059	W	.063	F	.062	M	.049	T	.042	S	.046	T	.047	T
30	.042	S			.053	W	.058	S	.043	M	.055	T	.059	S	.058	T	.039	F	.043	S	.043	W	.045	F
31	.038	M			.062	T			.051	T			.059	S	.064	W			.043	M			.044	S
Valid Days	31		27		30		26		26		29		31		31		30		31		29		31	
Maximum	.045		.055		.062		.061		.068		.068		.071		.068		.065		.064		.047		.050	
Violations																								
8167 Total Samples					0 Daily-maxima exceeding the standard of .125 ppm (starred[*])																			
93.2 % Possible					4 Missing days assumed to be less than the standard																			
352 Valid daily maxima					0 Daily maximums exceed the alert level of .200 ppm																			
Concentrations in parts per million (ppm)																								

Concentrations in parts per million (ppm)

EPA Proposed Primary Ozone Standards Attainment Status

Craters of the Moon NM

1994 Attainment Status With U.S. Environmental Protection Agency (EPA)
Proposed PRIMARY Ozone National Ambient Air Quality Standards
(61FR65716 December 13, 1996)

Ozone Season: April Through October

The primary National Ambient Air Quality Standard for ozone is designed to protect human health. The level of the proposed primary ozone standard is 0.08 parts per million (ppm) [80 parts per billion, (ppb)], daily maximum 8-hour average. The primary ozone standard is met at an ambient monitoring site when the 3-year average of the annual third-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.08 ppm. This standard is not met when the 3-year average is greater than 0.08 ppm. Using the EPA's rounding convention, a computed 3-year average ozone concentration of 0.085 ppm (85 ppb) is the smallest value that is greater than the level of the 0.08 ppm standard.

The proposed primary standard requires 90 percent data completeness, on average, during the 3-year period, with no single year within the period having less than 75 percent data completeness. This data completeness requirement would have to be satisfied in order to determine that the standard has been met at a monitoring site. However, calendar years with less than 75 percent data completeness are included in the computation if the annual third highest daily maximum 8-hour concentration is greater than the level of the standard. A site could be found not to have met the standard with less than complete data. The percent data completeness is the percent of valid ozone monitoring days. A day is valid if valid 8-hour averages are available for at least 75 percent of possible hours in the day (i.e., at least 18 of the 24 averages). An 8-hour average is considered valid if at least 75 percent (or 6) of the hourly averages for the 8-hour period are available.

The table below lists the 3-year average third highest daily maximum 8-hour ozone concentration based on data collected in 1994 and the two previous years. This is the number to compare to the level of the proposed primary standard. The 3-year average data completeness percent and the 1994 highest five daily maximum 8-hour averages are also tabulated. A * in the Data Comp % Met? column indicates EPA data completeness requirement was not met for the three year period.

Year	3-Year Avg 3rd High Daily Max 8-hr Ozone (ppb)	3-Year Avg Data Comp %	Data Comp % Met?	Annual 1st High Daily Max 8-hr Ozone (ppb)	Annual 2nd High Daily Max 8-hr Ozone (ppb)	Annual 3rd High Daily Max 8-hr Ozone (ppb)	Annual 4th High Daily Max 8-hr Ozone (ppb)	Annual 5th High Daily Max 8-hr Ozone (ppb)
1994	55	65	*	65	65	65	63	63

EPA Proposed Secondary Ozone Standards Attainment Status

Craters of the Moon NM

1994 Attainment Status With U.S. Environmental Protection Agency (EPA)
Proposed SECONDARY Ozone National Ambient Air Quality Standards
(61FR65716 December 13, 1996)

Ozone Season: April Through October

The secondary National Ambient Air Quality Standard for ozone is designed to protect human welfare. Welfare effects include, but are not limited to, effects on vegetation, wildlife, property and materials, visibility and climate. The proposed secondary ozone standard is based on a 3-month cumulative index that sums all ambient hourly concentrations greater than or equal to 0.06 ppm (or 60 ppb, parts per billion) during the hours 8:00 am to 8:00 pm local standard time. This standard is met at an ambient air quality monitoring site when the annual maximum cumulative index value (SUM06) based on a consecutive 3-month period is less than or equal to 25 parts per million-hours (ppm-hr). If the concentrations are expressed in ppb, then the index value is SUM60 and the standard level is 25,000 parts per billion-hours (ppb-hr). The standard is not met if the annual maximum 3-month SUM06 is greater than 25 ppm-hr. Using the EPA's rounding convention, a 3-month SUM06 of 26 ppm-hr is the smallest value that is greater than the level of the 25 ppm-hr standard.

The daily SUM06 index is computed at the monitoring site for each calendar day in each month during the ozone monitoring season. A month is considered a valid ozone monitoring month if ozone concentrations are available for at least 75 percent of all possible 8 am to 8 pm hours in the month. For months with greater than 75 percent data completeness, the monthly total SUM06 is adjusted for missing data by multiplying the unadjusted SUM06 monthly index value by the ratio of the number of possible daylight hours to the number of daylight hours with valid ambient hourly concentrations.

The table below lists the 1994 annual maximum 3-month cumulative SUM06 and the ending month of the 3-month period in which this maximum was calculated.

Year	Ending Month of 3-month period with maximum SUM06	Maximum 3-Month Cumulative SUM06 (ppm-hr)
1994	JUL	10

Ozone
Ten Highest Daily 1-Hour Average Maximum Concentrations
Craters of the Moon National Monument

Final Data
01/01/94 - 12/31/94

Rank	Date	Hour	Concentration (ppm)
1	07/23/94	17	0.071*
2	07/24/94	16	0.069*
3	05/15/94	19	0.068*
4	06/18/94	13	0.068*
5	08/20/94	14	0.068*
6	08/25/94	16	0.067
7	05/06/94	15	0.066*
8	06/19/94	18	0.066
9	08/24/94	17	0.066
10	05/18/94	16	0.065**

* Other high value(s) were also recorded during one or more hours in the day.

** This value was also recorded on one or more days later in the reporting period.

Note: The primary and secondary ambient air standard for ozone is 0.12 ppm averaged over a one hour period not to be exceeded more than once per year. (A value greater than .12 ppm, 124 ppb, or 235 ug/m³ exceeds the standard.) (40 CFR 50.9 with reference to Appendix D and H.)

Episodes with 1-Hour Ozone Concentrations
 ≥ 100 ppb and > 124 ppb
 Craters of the Moon National Monument

Final Data
 01/01/94 - 12/31/94

01/01/94 - 12/31/94

Date	Beginning Hour	No. Hours		Max (ppb)
		> 100 ppb	>124 ppb	
No values exceeded 100 ppb during this period				
Total		0	0	

Note: The primary and secondary ambient air standard for ozone is 0.12 ppm over a one hour period not to be exceeded more than once per year. (A value greater than .12 ppm, 124 ppb, or 235 ug/m³ exceeds the standard.) (40 CFR 50.9 with reference to Appendix D and H.)

Ozone Rank Listings of Second Highest 1-Hour Average Concentrations, Maximum 8-Hour Average Concentrations, and Annual SUM60 Exposure Index for All NPS Monitoring Sites
01/01/94 - 12/31/94

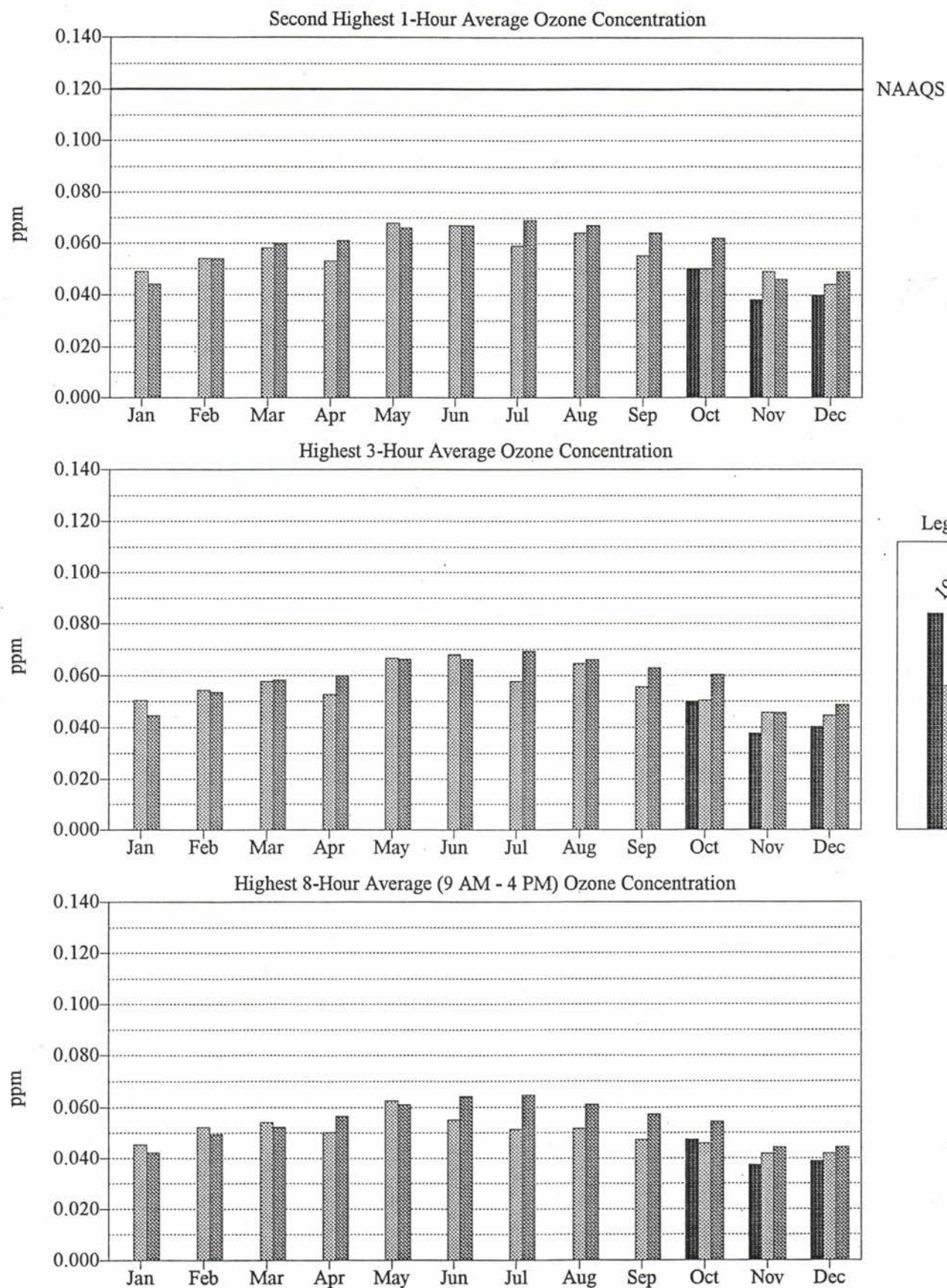
Second Highest 1-Hour Average Concentration		
Site	Rank	Concentration (ppb)
JOTR-YV	1	147
SEKI-AM	2	126
SEKI-LK	3	124
SEKI-GG	4	123
INDU-HQ	5	121
CHAM-XX	6	115
GRSM-CM	7	115
GRSM-LR	8	114
YOSE-TD	9	112
CACO-XX	10	109
GRSM-CC	11	109
ROMO-LP	12	106
MACA-OC	13	102
SAGU-PC	14	102
GRSM-CD	15	101
COWP-XX	16	99
DEVA-PV	17	98
YOSE-YV	18	97
PINN-ES	19	96
SHEN-DR	20	96
YOSE-CM	21	96
MORA-TW	22	95
ACAD-ST	23	95
SHEN-BM	24	93
YOSE-WV	25	92
LAVO-ML	26	91
COSW-XX	27	90
SHEN-SR	28	89
EVER-BC	29	85
BAND-XX	30	85
BIBE-KB	31	80
THRO-NO	32	78
CHIR-ES	33	77
GRCA-AB	34	76
GRBA-MY	35	74
CANY-IS	36	72
VOYA-BB	37	71
MEVE-MY	38	70
YELL-LY	39	70
CRMO-VC	40	69
OLYM-VC	41	60
GLAC-WG	42	60
HAVO-VC	43	53
DENA-HQ	44	52
REDW-RQ	45	50
HALE-OL	46	49

Maximum 8-hour Average Concentration (9 a.m. to 4 p.m.)		
Site	Rank	Concentration (ppb)
SEKI-LK	1	120
SEKI-GG	2	115
SEKI-AM	3	110
JOTR-YV	4	105
GRSM-CM	5	102
GRSM-LR	6	101
CHAM-XX	7	100
INDU-HQ	8	100
GRSM-CC	9	93
YOSE-TD	10	92
COWP-XX	11	91
YOSE-CM	12	90
GRSM-CD	13	89
YOSE-WV	14	88
DEVA-PV	15	88
MACA-OC	16	87
CACO-XX	17	87
SHEN-BM	18	85
MORA-TW	19	84
LAVO-ML	20	82
SHEN-SR	21	81
SHEN-DR	22	81
COSW-XX	23	80
BAND-XX	24	79
SAGU-PC	25	79
ROMO-LP	26	79
PINN-ES	27	78
YOSE-YV	28	78
BIBE-KB	29	73
EVER-BC	30	73
GRCA-AB	31	73
CHIR-ES	32	73
GRBA-MY	33	71
ACAD-ST	34	70
CANY-IS	35	68
VOYA-BB	36	65
CRMO-VC	37	64
YELL-LY	38	63
MEVE-MY	39	63
THRO-NO	40	60
GLAC-WG	41	55
DENA-HQ	42	52
HAVO-VC	43	50
HALE-OL	44	47
OLYM-VC	45	47
REDW-RQ	46	46

Annual Sum60 Exposure Index		
Site	Rank	Sum60 Count
JOTR-YV	1	204998 2696
SEKI-AM	2	176692 2281
SEKI-GG	3	167318 2180
SEKI-LK	4	143409 1805
YOSE-TD	5	139732 1966
GRSM-CM	6	101988 1470
DEVA-PV	7	95477 1406
GRSM-LR	8	94635 1366
SHEN-BM	9	73793 1101
YOSE-CM	10	69702 1015
SAGU-PC	11	60158 885
GRSM-CD	12	52963 796
SHEN-DR	13	50335 753
LAVO-ML	14	48090 711
PINN-ES	15	44901 655
COWP-XX	16	42881 619
YOSE-YV	17	40334 600
CHIR-ES	18	39280 617
YOSE-WV	19	34803 517
SHEN-SR	20	34758 518
ROMO-LP	21	34586 523
CACO-XX	22	31976 455
BAND-XX	23	31654 494
CANY-IS	24	30314 483
MACA-OC	25	29076 422
GRCA-AB	26	24570 386
BIBE-KB	27	22661 355
INDU-HQ	28	21966 311
GRBA-MY	29	20197 318
CHAM-XX	30	17526 238
CRMO-VC	31	16806 271
GRSM-CC	32	16512 239
ACAD-ST	33	14612 214
COSW-XX	34	10015 143
MEVE-MY	35	9019 145
MORA-TW	36	6347 89
YELL-LY	37	6015 96
VOYA-BB	38	3930 61
EVER-BC	39	2469 36
THRO-NO	40	1123 17
OLYM-VC	41	184 3
GLAC-WG	42	121 2
REDW-RQ	43	0 0
HALE-OL	44	0 0
HAVO-VC	45	0 0
DENA-HQ	46	0 0

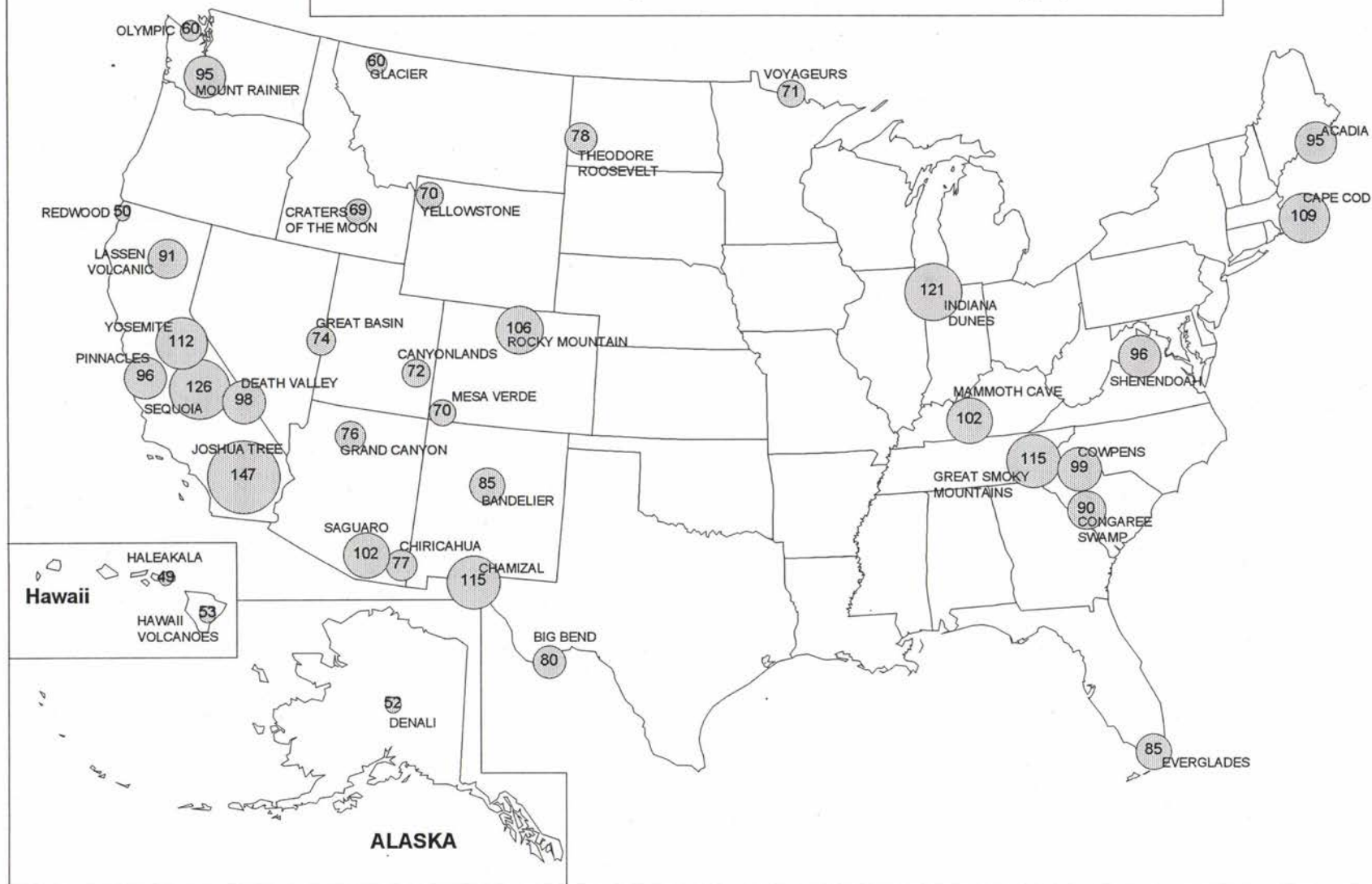
Ozone
Three Year Comparison of
Second Highest Concentrations

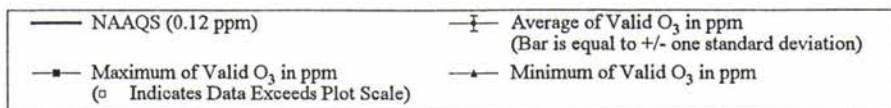
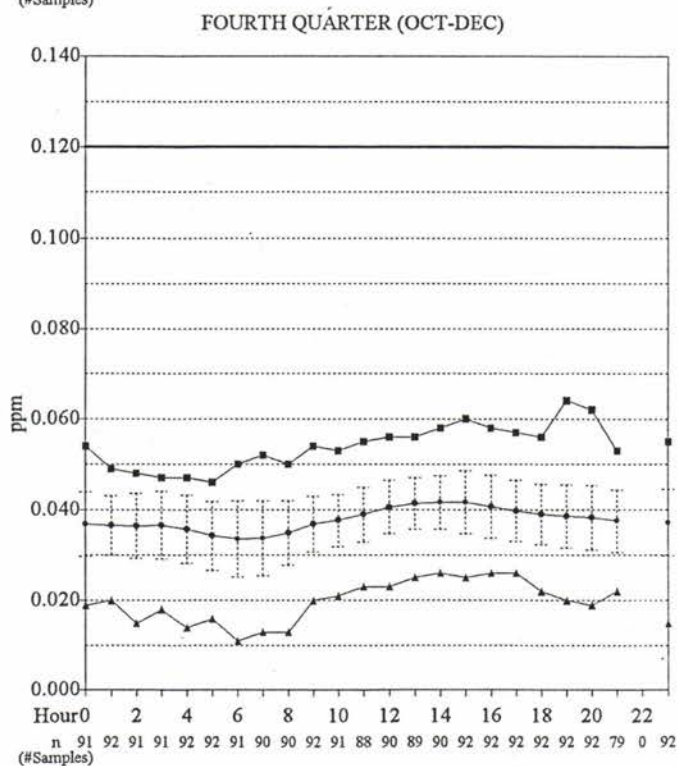
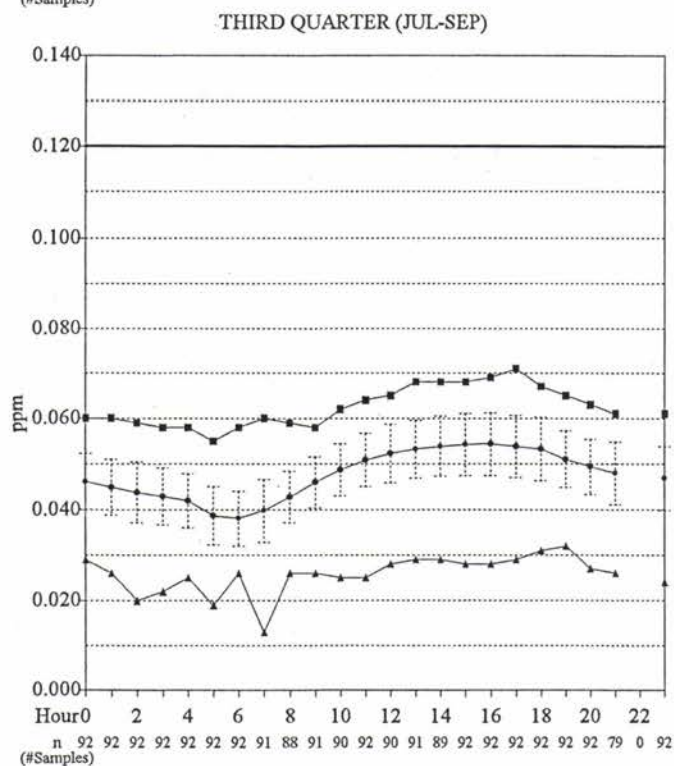
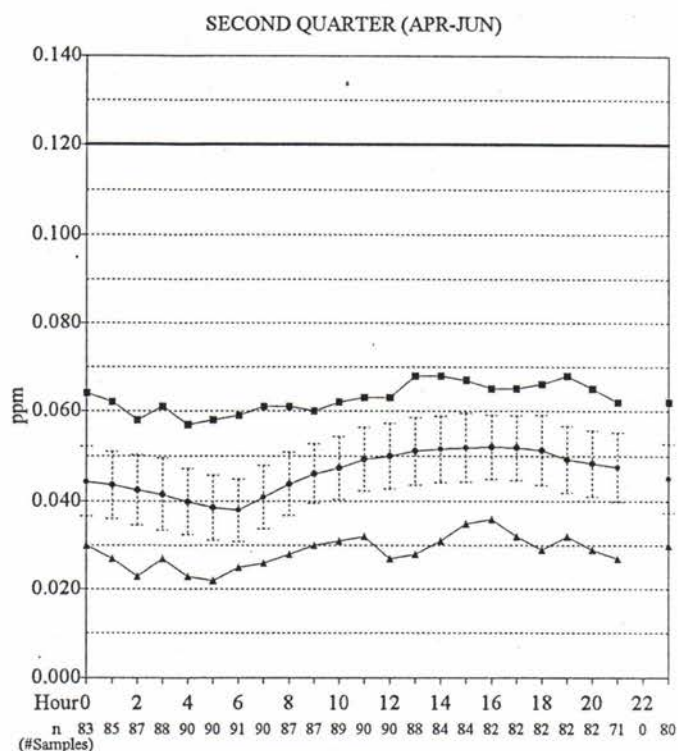
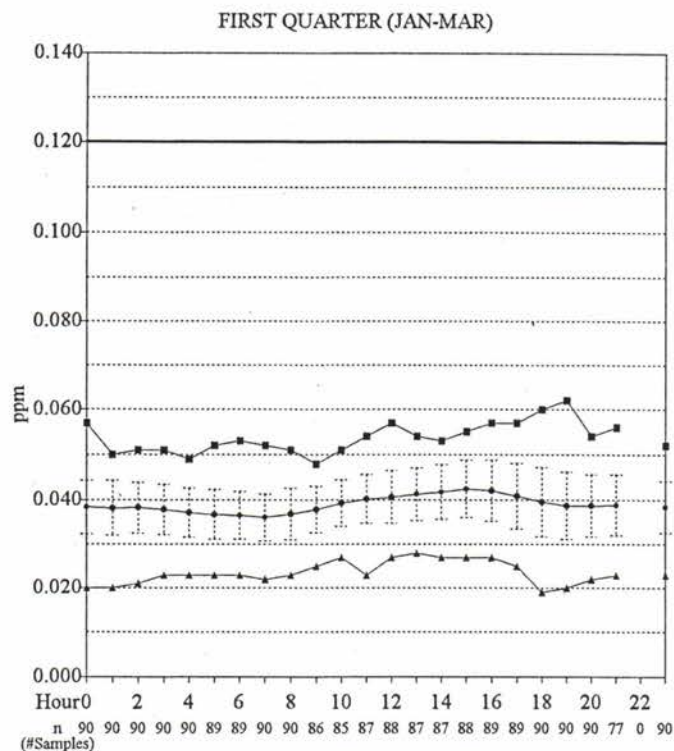
1992 - 1994

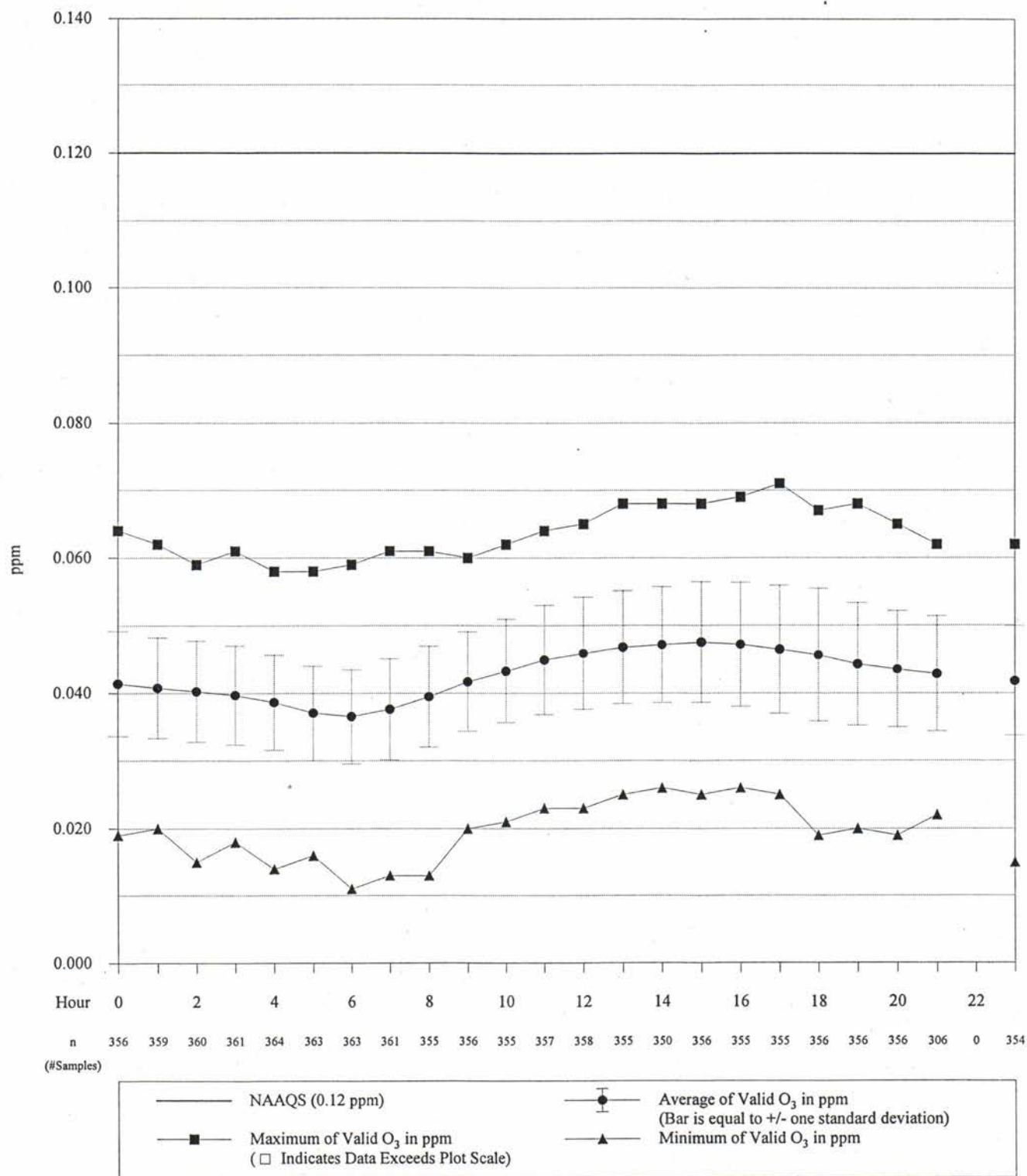


NATIONAL PARK SERVICE GASEOUS POLLUTANT MONITORING NETWORK

1994 Second Highest 1-Hour Ozone Concentrations (ppb)







Final Validation

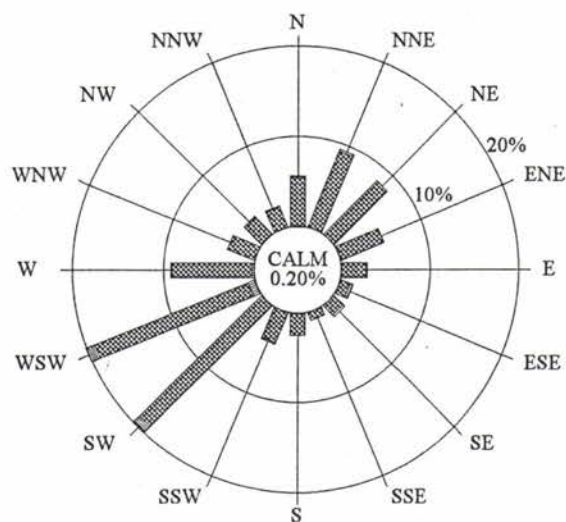
06-10-1997

Craters of the
Moon National Monument

Quarterly Ozone
Pollutant Roses

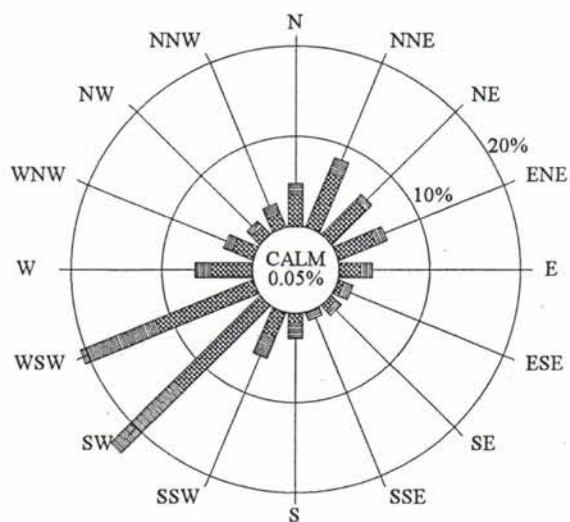
1994

FIRST QUARTER (JAN-MAR)



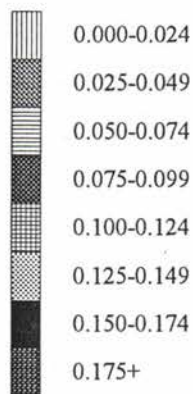
93.9% Collected 93.9% Valid
2160 Possible /2028 Collected /2028 Valid

SECOND QUARTER (APR-JUN)

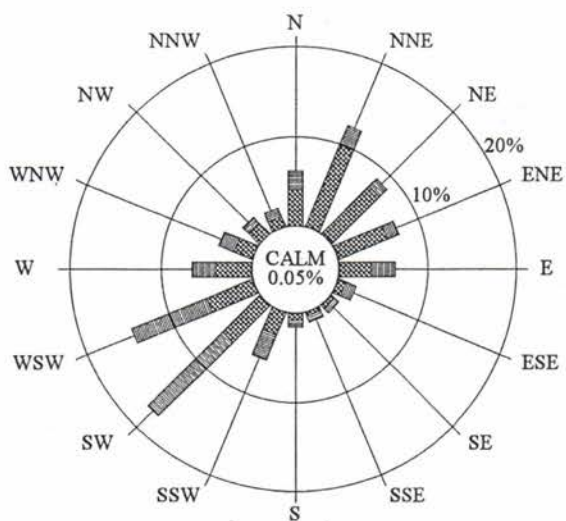


92.9% Collected 88.0% Valid
2184 Possible /2029 Collected /1921 Valid

Ozone (ppm)

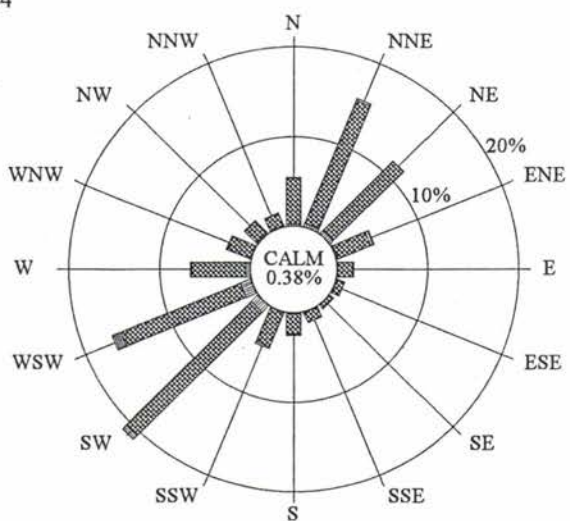


THIRD QUARTER (JUL-SEP)

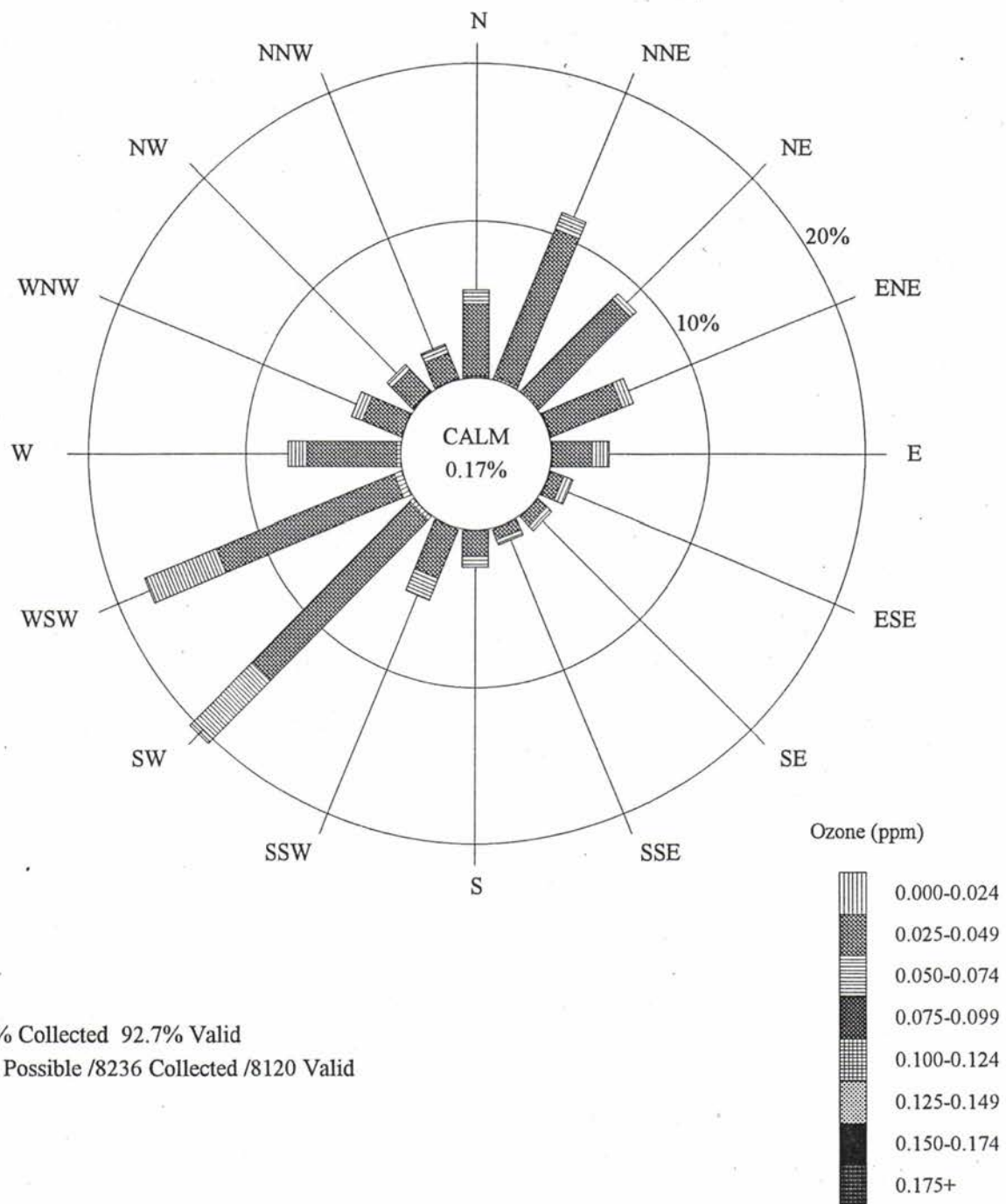


94.6% Collected 94.6% Valid
2208 Possible /2088 Collected /2088 Valid

FOURTH QUARTER (OCT-DEC)



94.7% Collected 94.3% Valid
2208 Possible /2091 Collected /2083 Valid



94.0% Collected 92.7% Valid
8760 Possible /8236 Collected /8120 Valid

Final Validation

07-28-1997

2.3 METEOROLOGICAL DATA SUMMARY

Summary of Selected Meteorological Data
Craters of the Moon National Monument

Final Data
01/01/94 - 12/31/94

Parameter	Value	Units	Number	Std Dev
SCALAR WIND SPEED				
Average	3.6	m/s	8701	2.6
Maximum	17.9	m/s		
Percent calm = 0.17				
AMBIENT TEMPERATURE				
Average	7.1	degC	8701	11.6
Maximum	33.7	degC		
Minimum	-18.2	degC		
*RELATIVE HUMIDITY - calculated				
Average	NA			
Maximum				
Minimum				
PRECIPITATION (Rainfall or Snow melt)				
Average non-zero rate	NA			
Maximum non-zero rate				
Minimum non-zero rate				
Accumulated during period				
SOLAR RADIATION				
Average Daily Total	380.512	ly/day	365	205.796
Maximum Daily Total	756.060	ly/day		
Minimum Daily Total	.360	ly/day		

Note: Calms are included in the average scalar wind speed and are defined as winds less than 0.5 m/s (1.0 mph).
Solar radiation terms are based on the calculation of the total amount of solar energy incident on a unit area during each day. The maximum and minimum daily totals are selected from the list of daily totals.
The totals for all days are then added and divided by the number of days to yield the average daily total.
NA indicates instrument not available.

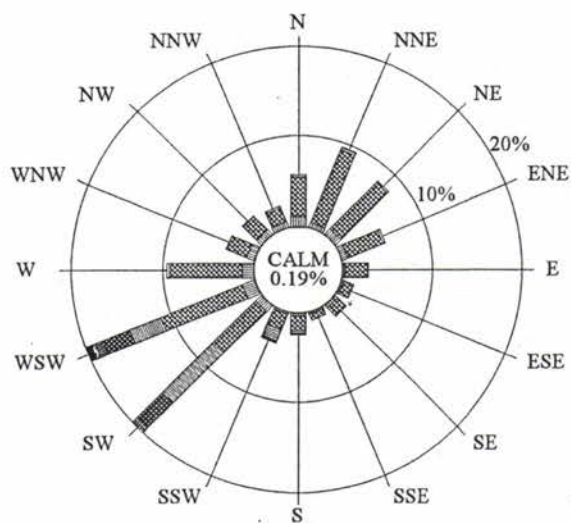
* The validity of calculated relative humidity is currently under investigation.

Craters of the Moon National Monument

Quarterly Wind Roses

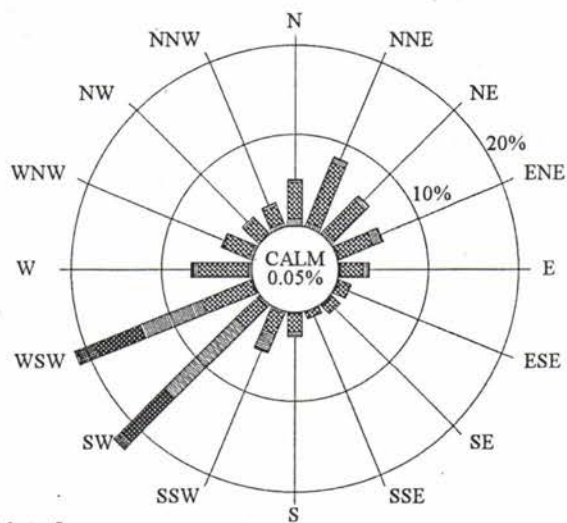
1994

FIRST QUARTER (JAN-MAR)



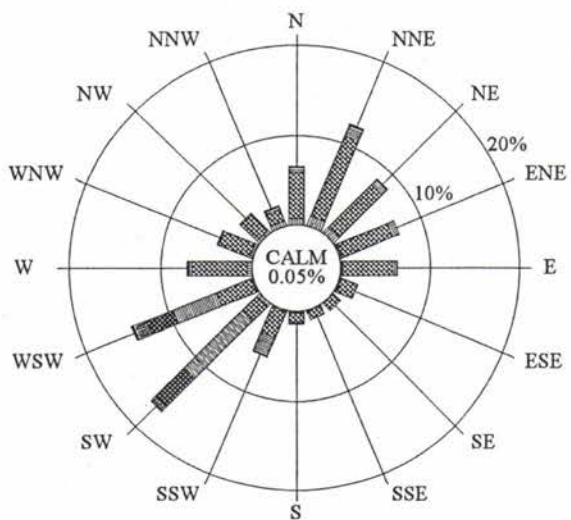
99.6% Collected 99.6% Valid
2160 Possible /2152 Collected /2152 Valid

SECOND QUARTER (APR-JUN)



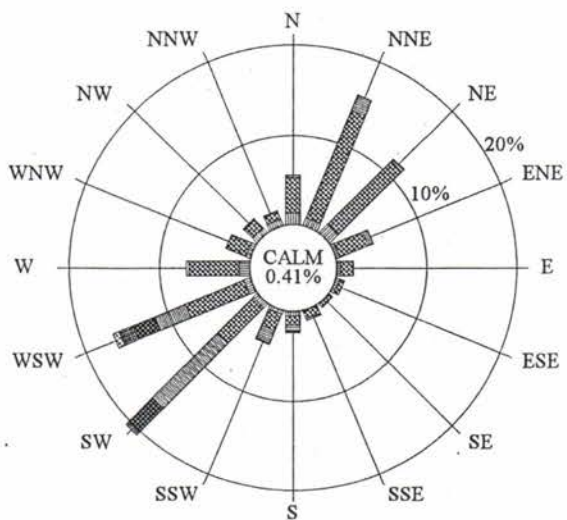
97.7% Collected 97.7% Valid
2184 Possible /2134 Collected /2134 Valid

THIRD QUARTER (JUL-SEP)

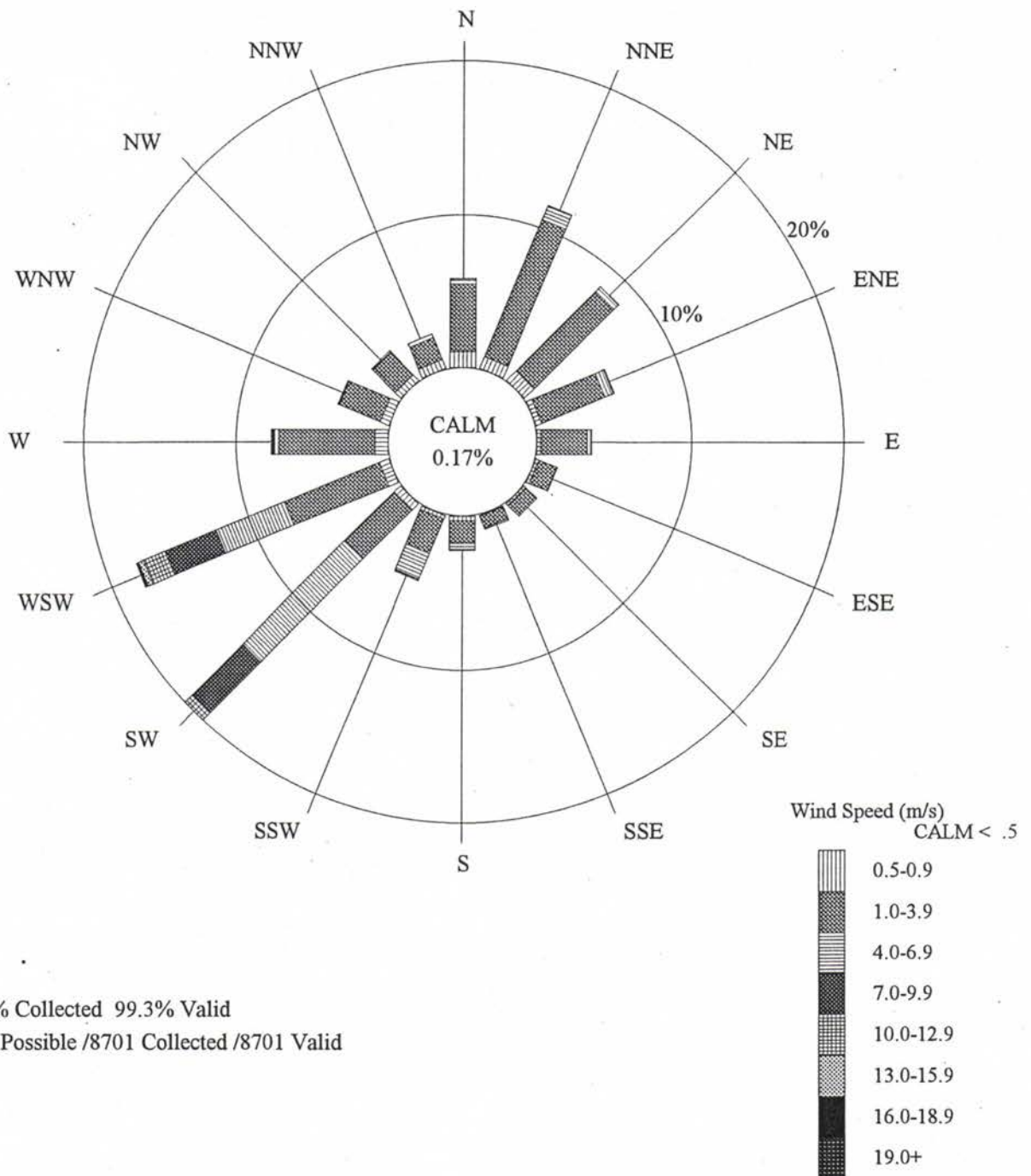


100.0% Collected 100.0% Valid
2208 Possible /2207 Collected /2207 Valid

FOURTH QUARTER (OCT-DEC)



100.0% Collected 100.0% Valid
2208 Possible /2208 Collected /2208 Valid



99.3% Collected 99.3% Valid
8760 Possible /8701 Collected /8701 Valid

Final Validation

07-25-1997

3.0 NATIONAL PARK SERVICE AIR RESOURCES DIVISION DATA SOURCES

3.1 GUIDE TO ATTACHED DATA DISKS

The attached data disks contain ASCII files of the validated hourly data, as shown in the following table. These files may be viewed with the Microsoft¹ browser included on the disk. Run the browser as you would any executable file and, using the *File-Open* menu option, open the file you wish to examine. These data may also be imported into other programs to perform additional data processing and analysis. The data format of each file is included within each file. The second table describes the validation codes used in the data tables to indicate why data are missing or invalid. Wind and pollutant frequency distribution tables in ASCII format are also included on the diskette.

Data users should acknowledge the National Park Service Air Resources Division whenever using these data or any portion of this report.

3.2 OTHER SOURCES FOR RETRIEVING NATIONAL PARK SERVICE GASEOUS POLLUTANT DATA

The data contained in this report may also be obtained from the following sources:

- National Park Service AIRWeb (<http://www.aqd.nps.gov/natnet/ard>) - available after last quarter 1997
- EPA AIRS database
- Data requests directed to:

NPS Air Resources Division
Information Management Center
c/o Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, Colorado 80525
Telephone: (970) 484-7941
Fax: (970) 484-3423
E-Mail: AIR-IMC@AIR-RESOURCE.COM

¹ Microsoft, Word, Excel, and Windows are all trademarked and licensed to Microsoft Corp. Use of this software to prepare this document is not an endorsement or recommendation by the NPS ARD for these products.

Data Disk Contents Summary	
File Name (s)	Description
ssssyy.DAT	All Validated Air Quality Data
ssssyymm.ppp	Monthly Data Summary Tables
ssssAN94.Rpp	Annual Wind and Pollutant Frequency Distribution
ssssQ194.Rpp	Quarter 1 Wind and Pollutant Frequency Distribution
ssssQ294.Rpp	Quarter 2 Wind and Pollutant Frequency Distribution
ssssQ394.Rpp	Quarter 3 Wind and Pollutant Frequency Distribution
ssssQ494.Rpp	Quarter 4 Wind and Pollutant Frequency Distribution
Where: ssss = site code yy = year mm = month ppp = air quality data parameter code AN = Annual Qn = Quarter 1-4 R = Wind Frequency distribution table	

NPS IMC and AIRS Invalid Data Codes			
NPS IMC VAL CODE	REASON	AIRS CODE	AIRS REASON
TO	Sample time out of limits	9973	Sample time out of limits
IW	Instrument warmup	9978	Voided by operator
OE	Operator error	9978	
BM	Begin monitoring	9979	Miscellaneous void
TL	Station temp low	9979	
OS	Off scale	9979	
EM	End monitoring	9979	
LI	Local interference	9979	
TH	Station temp high	9979	
IM	Instrument malfunction	9980	Machine malfunction
IN	Interference	9981	Bad weather
RF	Recording system failure	9983	Collection error
NA	No data	9987	Monitoring waived
PF	Power failure	9988	Power Failure
PC	Precision check	9990	Precision Check
ZS	Instrument zero/span check	9991	QC Control Points (Zero/Span)
SA	System audit	9992	QC Audit
PA	Performance audit	9992	
MT	Maintenance	9993	Maintenance/Routine Repairs
OR	Out for repair	9993	
CA	Calibration	9995	Multipoint calibration
SC	Station check	9998	Precision/zero/span

4.0 GLOSSARY

4.1 DEFINITIONS AND COMPUTATIONAL PROCEDURES FOR NATIONAL PARK SERVICE QUICK LOOK ANNUAL SUMMARY STATISTICS REPORT

The National Park Service Quick Look Annual Summary Statistics Report (Section 2.2) provides ozone summary statistics for various indices computed on a monthly basis for an entire year. Growing season (generically defined to be May 1 - September 30) and annual statistics are also presented under the "MAY-SEP" and "ANNUAL" columns, respectively. All concentrations are expressed in the units of parts per billion (PPB) and exposures in parts per billion-hours (PPB-HR). The definitions for each of the statistics appearing on the Quick Look Annual Summary Table are given below.

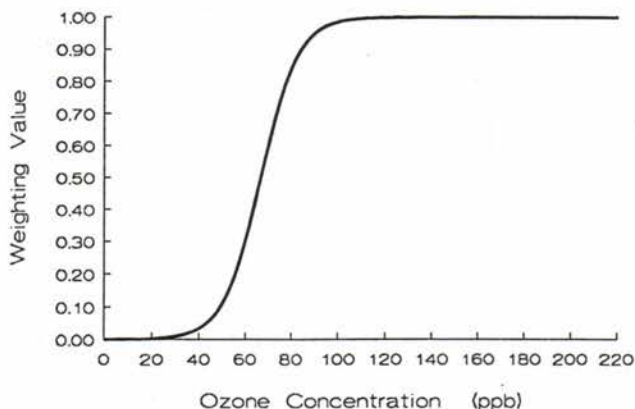
- (1) **Daily 1-Hr Maximum.** The maximum 1-hour average concentration recorded during each month, the growing season or the year regardless of the number of valid hourly observations recorded during a given day. The number in parentheses below this statistic, (N), indicates the number of days in the month, growing season, or year with valid data.
- (2) **Average Daily Maximum.** The average of all Daily 1-Hr Maxima during the month regardless of the number of Daily 1-Hr Maxima recorded during the month. For the "MAY-SEP" column the average of all the Daily Maxima recorded during the growing season is given. For the "ANNUAL" column the average of all the Daily Maxima is given. N is as in (1) above.
- (3) **Maximum Daily Mean.** The maximum of the valid daily means computed for each month, the growing season ("MAY-SEP" column), and the year ("ANNUAL" column). A valid daily mean is one for which 75% of the observations are available for each day, i.e., 18 hours. N is the number of days during each month, growing season, and year with at least 18 observations.
- (4) **Average Daily Mean.** The average of all valid daily means for the month, the growing season ("MAY-SEP" column), and the year ("ANNUAL" column). N is as in (3) above.
- (5) **Max Peak:Min Ratio.** The ratio of the Daily 1-Hr Maximum to the Daily 1-Hr Minimum. A ratio is computed only if a valid Daily Mean is computed and if the Daily 1-Hr Minimum is not equal to zero. N is the number of days with a valid Peak:Min ratio.
- (6) **Average Peak:Min Ratio.** The average of all Peak:Min ratios for the month, growing season, or year. N is as in (5) above.
- (7) **Max 9AM-4PM Average.** The maximum of all valid 9AM-4PM Averages computed for the month, growing season, or year. A valid 9AM-4PM Average is one which has 75% of the observations available during that time period (i.e., 6 hours. N is the number of days with valid averages.)

- (8) **Monthly 9AM-4PM Average.** The average of all valid 9AM-4PM Averages for the month, growing season, or year. N is as in (7) above.
- (9) **Max 7AM-7PM Average.** The maximum of all valid 7AM-7PM Averages computed for the month, growing season, or year. A valid 7AM-7PM Average is one which has 75% of the observations available during that time period, i.e., 9 hours. N is the number of days with valid averages.
- (10) **Monthly 7AM-7PM Average.** The average of all valid 7AM-7PM averages for the month, growing season, or year. N is as in (9) above.
- (11) **Monthly Mean.** The average of all 1-Hr ozone concentrations recorded during the month, growing season, or year. A mean is computed regardless of the number of hours with valid data. N is the number of hours with valid observations.
- (12) **SUM0 Exposure Index.** The monthly sum of all hourly ozone concentrations. Units are PPB-HR. The "MAY-SEP" column sums across the months of May through September to give the cumulative exposure for the growing season. The "ANNUAL" column sums across every month to give the cumulative exposure for the year. N is the number of hours with valid observations and is the same N as in (11) above.
- (13) **SUM60 Exposure Index.** The monthly sum of all hourly ozone concentrations equaling or exceeding 60 PPB. Units are PPB-HR. The "MAY-SEP" column sums across the months of May through September to give the cumulative exposure for the growing season. The "ANNUAL" column sums across every month to give the cumulative exposure for the year. N is the number of hours equaling or exceeding 60 PPB during the month, growing season, or year.
- (14) **SUM80 Exposure Index.** The monthly sum of all hourly ozone concentrations equaling or exceeding 80 PPB. Units are PPB-HR. The "MAY-SEP" column sums across the months of May through September to give the cumulative exposure for the growing season. The "ANNUAL" column sums across every month to give the cumulative exposure for the year. N is the number of hours equaling or exceeding 80 PPB during the month, growing season, or year.
- (15) **W126 Exposure Index.** The monthly sum of all hourly ozone concentrations where each concentration is weighted by a function that gives greater emphasis to the higher hourly concentrations while still including the lower ones. This weighting function provides a weighting value that is unique for each hourly ozone concentration. The weighting function, as described by Lefohn, Laurence, and Kohut¹ is:

$$w_i = \frac{1}{1 + 4403 \exp(-.126c_i)}$$

where

Weighting Function Used To Calculate
W126 Exposure Index



w_i = weighting value for hourly concentration i ,
and
 c_i = hourly concentration i in PPB.

The graph of weighting value versus ozone concentration, in the figure to the left, illustrates the greater weights given to higher hourly ozone concentrations.

Each hour's weighting value is multiplied by its corresponding hourly concentration. This product is summed over all the valid hours in each month to calculate the monthly W126 exposure.

Thus, the monthly W126 exposure is:

$$W126 = \sum_{i=1}^n w_i c_i$$

where

W126 = monthly W126 exposure index,
 w_i = weighting value for hourly concentration i ,
 c_i = hourly concentration i in PPB, and
 n = number of hours in the month with valid ozone concentrations.

The "MAY-SEP" column sums across the months of May through September to give the cumulative exposure for the growing season. The "ANNUAL" column sums across every month to give the cumulative exposure for the year. The exposure units are PPB-HR.

Because each hour contributes to this exposure index, N is the number of hours with valid observations and is the same N as in (11) and (12) above.

The U.S. Environmental Protection Agency usually considers air quality statistics, such as a mean, to be "valid" (i.e., representative of the parameter being estimated for the time interval in question) only if 75% or more of the total possible observations have been measured during that time interval. Therefore, one should exercise caution when comparing these statistics between months and sites, particularly those that are not averages (e.g., maxima and exposures) whenever the number of valid observations is less than 75% of the total possible.

References

1. Lefohn, A.S., J. A. Laurence, and R. J. Kohut. 1988. A Comparison of Indices That Describe the Relationship Between Exposure to Ozone and Reduction in the Yield of Agricultural Crops. *Atmospheric Environment* 22, 1229-1240.

4.2 AIR QUALITY GLOSSARY

Acid Deposition: Air pollution produced when acid chemicals are incorporated into rain, snow, fog, or mist.

Aerometric Information Retrieval System (AIRS): A computer-based database of U.S. air pollution information administered by the EPA Office of Air Quality Planning and Standards (U.S. Environmental Protection Agency).

AIRWeb: Air Resources Web, an air quality information retrieval system for U.S. parks and wildlife refuges developed by the Air Resources Division of the National Park Service and the Air Quality Branch of the Fish and Wildlife Service.

Air Pollutant: An unwanted chemical or other material found in the air.

Air Pollution: Degradation of air quality resulting from unwanted chemicals or other materials occurring in the air.

Air Quality: The properties and degree of purity of air to which people and natural and heritage resources are exposed (in the context of national parks).

Air Pollution Control Permitting Process: Process by which facilities are permitted to emit specified types and quantities of air pollutants.

Air Quality Related Values (AQRVs): Values including visibility, flora, fauna, cultural and historical resources, odor, soil, water, and virtually all resources that are dependent upon and affected by air quality. "These values include visibility and those scenic, cultural, biological, and recreation resources of an area that are affected by air quality." (43 Fed. Reg. 15016)

Ambient Air: Air that is accessible to the public.

Class I: Areas of the country set aside under the Clean Air Act to receive the most stringent degree of air quality protection.

Class II: Areas of the country protected under the Clean Air Act but identified for somewhat less stringent protection from air pollution damage than Class I, except in specified cases.

Clean Air Act: Originally passed in 1963, our current national air pollution control program is based on the 1970 version of the law. Substantial revisions were made by the 1990 Clean Air Act Amendments.

Continuous Sampling Device: An air analyzer that measures air quality components continuously.

Criteria: Information on health and/or environmental effects of pollution (in the context of criteria air pollutants).

Criteria Air Pollutant: A group of very common air pollutants regulated by EPA on the basis of criteria and for which a National Ambient Air Quality Standard is established (SO₂, NO₂, PM₁₀, Pb, CO, O₃).

Emissions: Release of pollutants into the air from a source.

Environmental Protection Agency (EPA): The federal agency responsible for regulating air quality.

Monitoring: Measurement of air pollution.

National Ambient Air Quality Standards (NAAQS): Permissible levels of criteria air pollutant established to protect public health and welfare.

Ozone (O₃): A criteria air pollutant that is a strong oxidizing agent, reactive with many other compounds and surfaces, and a health hazard in high concentrations. Ozone is formed by nitrogen oxides and organic compounds reacting in sunlight.

Source: Any place or object from which air pollutants are released. Sources that are fixed in space are stationary sources; sources that move are mobile sources.

Sulfur Dioxide (SO₂): A criteria air pollutant that is a gas produced by burning coal and some industrial processes.

* Recent updates to this glossary may be found on the NPSARD AIRWeb - <http://www.aqd.nps.gov/natnet/ard/glossary.htm>.
