



Annual Data Summary 2011

Gaseous Pollutant Monitoring Program

Natural Resource Data Series NPS/NRSS/ARD/NRDS—2013/443



ON THE COVER

Grand Teton National Park, Wyoming.

Photograph by Jessica Ward, Air Resource Specialists, Inc.

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The National Park Service, Natural Resource Stewardship and Science offices in Fort Collins, Colorado publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Data Series is intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

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Introduction

This report focuses on the gaseous air pollutant concentrations measured in national parks during 2011 as part of the National Park Service, Air Resources Division (NPS ARD) monitoring program. It is mostly a statistical summary and feedback for park staff. The primary air pollutants reported, including ozone (O₃), sulfur dioxide (SO₂), and inhalable particulate matter (PM_{2.5}), are known to cause human health problems and to injure natural resources. The U.S. Environmental Protection Agency (EPA) sets standards to which we can compare the monitored data. More information on air quality conditions and trends in the parks can be found in the Division’s annual performance reports (<http://www.nature.nps.gov/air/index.cfm>).

In recent years ozone pollution at surface monitoring sites in the national parks has been decreasing. In 2011, only 8 parks with monitors within the park had ozone concentrations that exceeded the National Ambient Air Quality Standard (NAAQS), which is currently at 75 ppb for an 8-hour average. Parks with high ozone are listed below with NAAQS relevant statistics.

Most of these parks are in California and have air pollutants transported into them from more populated areas to the west. A fourth park unit in California, Mojave National Preserve, has been found to have high ozone based on portable ozone

monitors, with the 4th highest 8-hour concentration of 77 ppb and 6 exceedance days. The Mojave station had higher ozone concentrations than the nearby Death Valley station, which had a 4th highest 8-hour average ozone concentration of 75 ppb.

Several parks are located in areas that have been designated in non-attainment of the ozone standard. A non-attainment designation means that an area does not meet the ozone standard, which is a 3-year average of the 4th highest 8-hour average ozone concentration of 75 ppb. The following map presents park units that fall within these non-attainment areas. In total, 73 park units fall within the boundaries of counties that are designated as such. Parks located in non-attainment areas that are presented in this report are:

- Great Smoky Mountains National Park, TN
- Indiana Dunes National Lakeshore, IN
- Joshua Tree National Park, CA
- Kings Mountain National Military Park, SC
- Mojave National Preserve, CA
- Rocky Mountain National Park, CO
- Sequoia & Kings Canyon National Parks, CA
- Yosemite National Park, CA

A current list of areas classified as non-attainment by the EPA can be found at <http://www.epa.gov/oar/oaqps/greenbk/hnc.html>.

Park	2011 4 th high 8-hr	Exceedances	3-yr avg 4 th high 8-hr
Sequoia and Kings Canyon	98 ppb	87 days	96 ppb
Joshua Tree	91 ppb	56 days	93 ppb
Great Smoky Mountains	83 ppb	12 days	77 ppb
Big Bend	80 ppb	7 days	69 ppb
Yosemite	78 ppb	7 days	77 ppb
Rocky Mountain	77 ppb	8 days	74 ppb
Dinosaur (POMS)	90 ppb	8 days	---
Mojave (POMS)	77 ppb	6 days	---

Other gaseous pollutants are measured in fewer parks. PM_{2.5} is now being measured with continuous monitors in 14 park or park-supported units. Unhealthy conditions, as defined by the NAAQS for PM_{2.5}, did not occur in any park unit during 2011. SO₂ is measured by the National Park Service in Hawaii Volcanoes, Great Smoky Mountains, and Mammoth Cave, but only Hawaii Volcanoes has extreme SO₂ concentrations that far exceed the current NAAQS of 75 ppb as a daily 1-hour maximum.

Several new stations are being reported this year:

- Grand Teton National Park operates in partnership with the Wyoming Department of Environment Quality and includes a Webcamera.
- Stations at Rangely and Meeker, CO, are operated by NPS for BLM as part of the Three State Study on the effects of emissions from oil and gas development in western Colorado and eastern Utah.
- A station at Escalante, UT, was installed in 2011 for the Three State Study but had too little data to report for 2011.
- A station at Walden, CO, was also installed in 2011 as part of the Three State Study.

- The portable ozone monitoring system (POMS) station at Dinosaur National Monument, CO, is now operated year-round. The station observed exceedances of the ozone standard in 2011 that are indicative of emissions impact from development activity in the Uintah Basin.

Both current and past data from NPS monitoring sites is available on the Web:

- Current air quality (<http://www.nature.nps.gov/air/data/current/index.cfm>).
- Interactive data and report products access to validated archive database (<http://ard-request.air-resource.com/data.aspx>).
- AirNow has current air quality conditions and forecasts for national parks and urban locations (http://airnow.gov/index.cfm?action=airnow.national_summary).

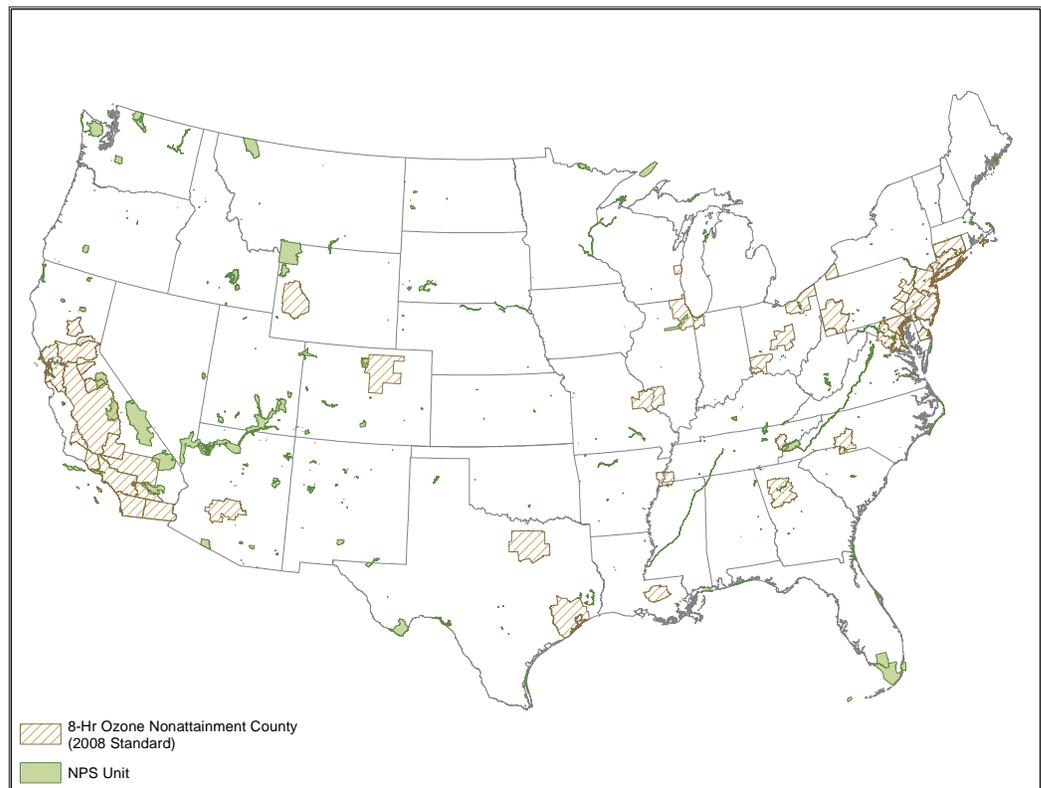


Figure 1. Designated 8-hour ozone non-attainment counties in the United States.

Monitoring Results

The NPS ARD issues this annual data summary for their Gaseous Pollutant Monitoring Program (GPMP), which includes the NPS monitors under the CASTNet program and those state stations that are in or very near national parks. These summaries present only O₃, SO₂, NO_x, CO, PM, and meteorological data from continuous monitors that report hourly data. Other gas, particulate, and precipitation monitoring is performed under the visibility and deposition programs and is reported separately.

Data collected by this monitoring program are incorporated into the EPA Air Quality System (AQS) database, which is a national database of air quality data collected throughout the country. These data are also stored in the NPS ARD's Information Management Center (IMC), and are publicly available through the NPS ARD's Web site at <http://www.nature.nps.gov/air/Monitoring/network.cfm#data>.

GPMP Network Monitoring

The locations of monitoring sites that operated during 2011 are presented on the map in Figure 2. The parameters monitored at each park unit are indicated with colored flags. The CASTNet flag identifies sites where the NPS operates Clean Air Status and Trends Network monitoring systems in cooperation with EPA to measure ozone and estimate dry atmospheric deposition. The enhanced gaseous and/or particulates flag indicates that the NPS sponsors additional or high-resolution gaseous or particulate monitoring at that park unit. Monitoring agencies and park units with more than one monitoring site are indicated. Site specifications, including site names, abbreviations, AQS identification numbers, locations, and monitored parameters are listed in Table 1.

In addition to monitoring for regulatory compliance, the NPS added portable ozone monitoring systems to the GPMP in 2003. The POMS monitors have recently been designated by the EPA as a federal equivalency method (FEM) to measure certifiable ozone data. Although the POMS are not currently operated according to this protocol, the data are equivalent to the certified monitors and can be used for survey monitoring to obtain air quality

baseline information. POMS site names in tables and figures have been underlined to distinguish them from monitoring sites meeting all EPA guidelines.

The NPS cooperates with a number of state agencies. At some sites, state air quality agencies provide measurement and operations support, and data are generally shared directly among cooperating agencies. Relevant O₃, SO₂, PM, and meteorological data submitted by states to the EPA AQS are retrieved for inclusion in this report.

Annual Ozone Summaries

In 2008 the primary National Ambient Air Quality Standard (NAAQS) for ozone changed from 0.08 ppm (85 ppb equivalent) over an 8-hour period to 0.075 ppm (75 ppb equivalent) over an 8-hour period (http://www.epa.gov/ttn/naaqs/standards/ozone/s_o3_index.html). According to the current standard, an exceedance of the standard occurs when an 8-hour average ozone concentration is greater than or equal to 76 ppb. An exceedance of the standard is not the same as a violation. A violation occurs when the 3-year average of the fourth highest daily maximum 8-hour average ozone concentration equals or exceeds 76 ppb. The secondary ozone standard defined by the EPA, which is intended to protect the environment, is the same as the primary standard. In this report, ozone concentrations are compared to the NAAQS that was in place during the period reported.

Table 2 summarizes O₃ measurements with respect to the daily maximum 8-hour average concentrations at each NPS monitoring site. The five highest daily maximum 8-hour average ozone concentrations are listed, as well as the total number of days with exceedances of the 8-hour standard. At each site with an EPA-certified monitor, the fourth highest value column and the number of days column are both color-coded to identify sites where the fourth highest daily maximum 8-hour average ozone value exceeded the standard during 2011. Note that other sites may have experienced fewer than four exceedances of the standard, and are not color coded. Ozone summary statistics for POMS are highlighted bold where exceedances occurred. These sites should be compared to EPA standards for reference purposes only.

The map in Figure 3 presents the annual fourth highest 8-hour average ozone concentrations for all network sites listed in Table 2. Ozone values for EPA-certified sites are color-coded to represent values below (green) and above (orange and red) the national standard. Values from portable sites (no color) are included for reference only.

The map in Figure 4 presents the annual number of days which exceeded the 8-hour standard for all network sites listed in Table 2. The data points are color-coded to distinguish between sites that did not exceed NAAQS (green) and those that did (orange and red). Data from portable sites (no color) are included for reference.

The map in Figure 5 presents the annual second highest 1-hour average ozone concentrations for all network sites. Ozone values for EPA-certified sites are color-coded to represent four distinct levels. Ozone values from portable sites (no color) are included for reference only.

Ozone Violation Summaries

Table 3 presents ozone violation summaries for NPS-operated and cooperating sites for all 3-year periods over the last 10 years. Violations of the (old) 85 ppb standard are indicated in orange and red. Values that violate the new standard of 75 ppb are outlined with a black box.

A violation of the standard occurs when the 3-year average of the fourth highest daily maximum 8-hour average ozone concentration equals or exceeds 76 ppb. Table values in parentheses indicate that EPA data completeness requirements for the 3-year period were not met. However, annual fourth highest daily maximum 8-hour ozone concentrations greater than or equal to 76 ppb for calendar years not meeting EPA data completeness requirements are included in the NAAQS violation computation.

Resource Injury Indices

To quantify ozone exposure to plants, various indices other than the NAAQS primary and secondary standards are often used. These indices, defined below, take into account both peak ozone concentrations and cumulative exposure to ozone.

- W126 – A cumulative index that is calculated as the maximum 3-month sum of the 0800-2000 hourly average ozone concentrations during the EPA-designated ozone season, where a weighting function is used to give increasing significance (weights between 0 and 1) to concentrations of ozone greater than 0.04 ppm (40 ppb), and no weight to concentrations below 0.04 ppm (40 ppb). Units of this index are ppm-hr.
- SUM06 – A cumulative index that is calculated as the maximum 3-month sum of the 0800-2000 hourly average ozone concentrations during the ozone season that are equal to or greater than 0.06 ppm (60 ppb). The units of this index are ppm-hr. Several thresholds have been developed for SUM06¹.

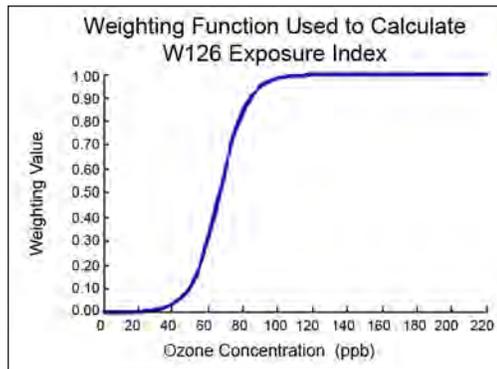
The W126 is expressed as a 3-month sum of all hourly ozone concentrations where each concentration is weighted by a sigmoidal function that gives greater emphasis to the higher hourly concentrations while still including the lower ones. In the latest use of W126, only the daytime hours of 8 am to 8 pm (12 hours) are used in the expression. This weighting function provides a weighting value that is unique for each hourly ozone concentration. The weighting function, as described by Lefohn, Laurence, and Kohut² is:

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

where

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

W126 and SUM06 thresholds for ozone effects to vegetation		
Growth Reduction	W126	SUM06
Tree seedlings - natural forest stands	7-13 ppm-hrs	10-15 ppm-hrs
Tree seedlings/saplings - plantations	9-14 ppm-hrs	12-16 ppm-hrs
Visible Foliar Injury		
Plants in natural ecosystems	5-9 ppm-hrs	8-12 ppm-hrs



The graph of weighting value versus ozone concentration, in the figure above, 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 daytime 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.

EPA is considering the maximum daytime consecutive 3-month value of the W126 for the secondary standard. The exposure units are ppb-hr.

Because each hour contributes to this exposure index, the number of hours with valid observations (n) is an important factor in calculating the W126. The EPA usually considers air quality statistics 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. EPA is developing fill-in rules for missing hourly data that may be issued when the revision to the ozone standard is announced in 2013³.

Table 4 presents the ozone exposure indices summary statistics for 2011. Summaries for POMS are included for comparison only. Since portable sites are deployed for seasonal use, there may be significant biases in W126 and SUM06 exposure indices calculated from their data.

Figure 6 presents the 3-month maximum W126 exposure index for all network sites listed in Table 4. Figure 7 presents the annual 3-month maximum SUM06 exposure index for the same sites. Index values are color-coded to represent three distinct levels of cumulative exposure. Data from portable sites (no color) are included for reference only.

¹Heck, W.W. and E.B. Cowling, 1997. The Need for a Long-term Cumulative Secondary Ozone Standard - An Ecological Perspective. *Environmental Management*. January: 23-33.

²Lefohn, A.S.; Lawrence, J.A.; Kohut, R.J. (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.

³U.S. EPA, 2010, Proposed Rule, National Ambient Air Quality Standards for Ozone, *Federal Register/Vol. 75, No. 11/Tuesday, January 19, 2010*.

Sulfur Dioxide Summaries

During 2011, the primary NAAQS for sulfur dioxide was a daily maximum 1-hour average of 75 ppb. The secondary NAAQS was a 3-hour mean of 0.50 ppm, not to be exceeded more than once per year. The EPA revised the SO₂ standard in June 2010 to add the primary 1-hour average standard. Table 5 summarizes sulfur dioxide measurements for comparison to the standards that were in place during 2011 and lists the number of exceedances for each.

Kilauea Volcano is the source of sulfur dioxide in Hawaii Volcanoes National Park. Sulfur dioxide data are collected in the park using a lower range and an upper range. The lower range does not capture values higher than 1 ppm (1,000 ppb), but is considered to be an EPA equivalency method. The upper range captures values above 1 ppm accurately, but is not an EPA equivalent range. The Hawaii Volcanoes National Park data presented in this report were collected using the upper range to give a more accurate representation of sulfur dioxide values.

Carbon Monoxide Summaries

The primary NAAQS for carbon monoxide is a daily maximum 1-hour average of 35 ppm and an 8-hour average of 9 ppm. An exceedance occurs when these limits are exceeded and a violation occurs when these limits are exceeded more than once a year. Table 6 summarizes the carbon monoxide measurements for 2011.

Nitrogen Dioxide Summaries

The primary hourly NAAQS for nitrogen dioxide is a daily maximum 1-hour average of 100 ppb. An exceedance occurs when this value is exceeded and a violation occurs when the 3-year average of the 98th percentile of the daily maximum 1-hour average exceeds 100 ppb.

The primary and secondary annual NAAQS for nitrogen dioxide is an annual arithmetic mean of 53 ppb. An exceedance and violation of the standard occurs when an annual arithmetic mean of nitrogen dioxide concentrations is greater than 53 ppb. Tables 7 and 8 summarize the nitrogen dioxide and oxides of nitrogen measurements, respectively, for 2011.

PM_{2.5} Data Summaries

The primary NAAQS for PM_{2.5} are an annual arithmetic mean of 15 µg/m³ and a daily arithmetic mean of 35 µg/m³. An exceedance of the standard occurs when either an annual arithmetic mean is greater than 15.0 µg/m³ or a daily arithmetic mean is greater than 35 µg/m³. An exceedance of the standard is not the same as a violation. A violation occurs when either the 3-year average of the annual mean is greater than 15.0 µg/m³ or the 3-year average of the 98th percentile daily mean concentrations is greater than 35 µg/m³.

Table 9 summarizes PM_{2.5} measurements with respect to both the daily 24-hour average maximum concentrations and the annual

arithmetic mean. The four highest and 98th percentile 24-hour average concentrations are listed, as well as the total number of days with 24-hour average PM_{2.5} concentrations greater than 35 µg/m³. No violation summaries for PM_{2.5} data are presented.

PM₁₀ Data Summaries

The primary NAAQS for PM₁₀ is a daily arithmetic mean of 150 µg/m³. An exceedance of the standard occurs when a daily arithmetic mean is greater than 150 µg/m³. An exceedance of the standard is not the same as a violation. A violation occurs when a 24-hour average concentration greater than 150 µg/m³ occurs more than once per year on average over three years.

Table 10 summarizes PM₁₀ measurements with respect to both the daily 24-hour average maximum concentrations and the annual arithmetic mean. The four highest 24-hour average concentrations are listed, as well as the total number of days with exceedances of the NAAQS 24-hour standard. The number of days column is color-coded to identify sites where an exceedance of the 24-hour standard occurred.

Table 11 presents a PM₁₀ violation summary based on the 24-hour average standard for one-year periods over the last three years, with violations indicated in red. Table values in parentheses indicate that the EPA data completeness requirement was not met. However, calendar quarters not meeting EPA data completeness requirements were included in the NAAQS violation computation if the resulting 24-hour average exceeds the standard.

Meteorological Data Summaries

Table 12 presents a summary of selected meteorological data for all sites. The parameters included are wind speed, ambient temperature, relative humidity, and precipitation.

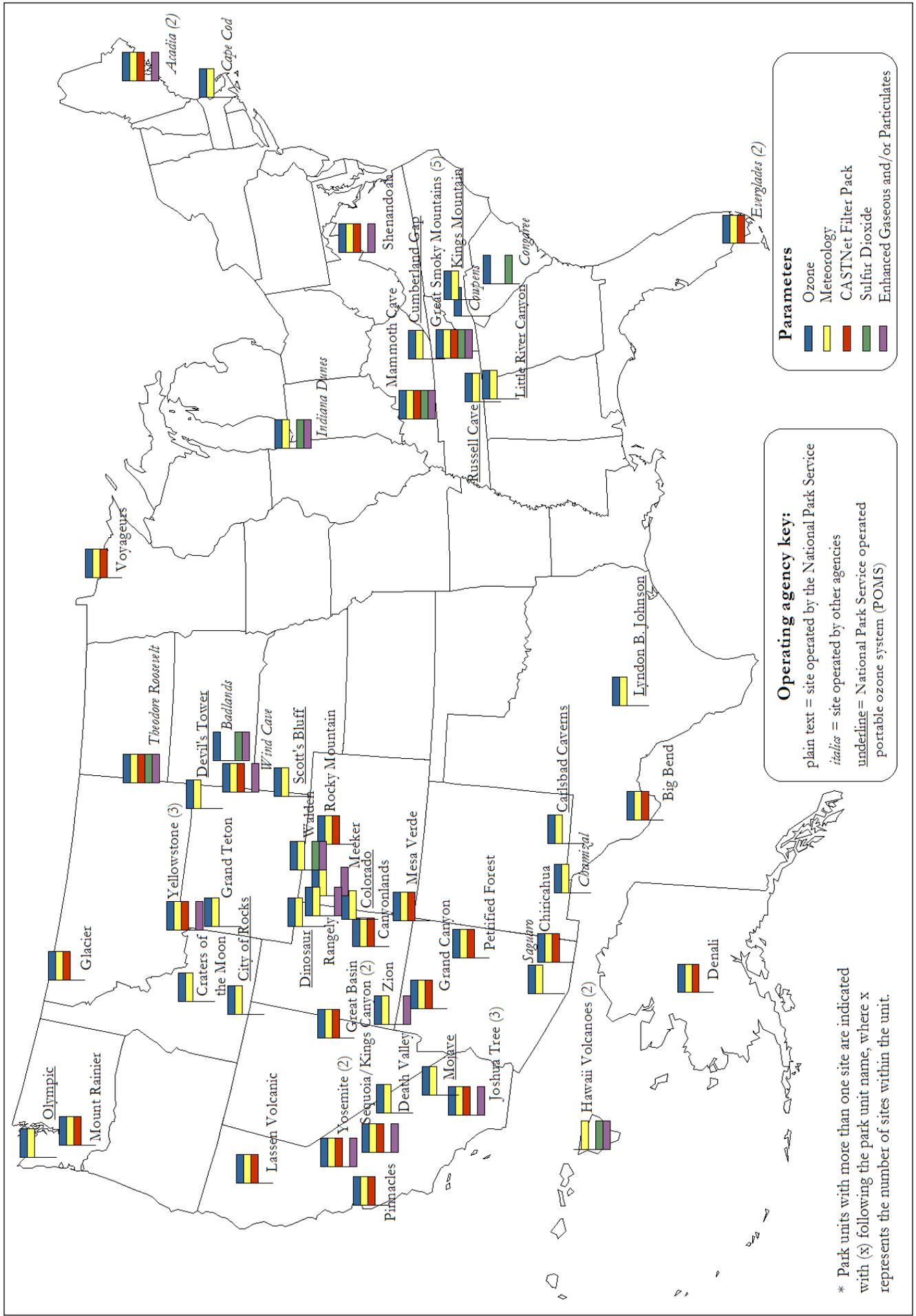


Figure 2. 2011 Air quality monitoring in or nearby park units.

Table 1. 2011 Site specifications.

National Park Unit	Site Name	State	NPS Abbr.	CASTNet Abbr.	AQS ID Number	Latitude (degrees north)	Longitude (degrees west)	Elev. (m)	O ₃ Years ^a	SO ₂	CO	NO _x	PM	WS/WD	TMP	RH	RNF	SOL	Filter Pack ^b
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)																			
Big Bend	K-Bar Ranch Road	TX	BIBE-KB	BBE401	48-043-0101	29.3022	103.1772	1052	22	---	---	---	---	X	X	X	X	X	X
Canyonlands	Island in the Sky	UT	CANY-IS	CAN407	49-037-0101	38.4586	109.8211	1809	20	---	---	---	---	X	X	X	X	X	X
Carlsbad Caverns	Maintenance Area	NM	CAVE-MA	---	35-015-3001	32.1792	104.4417	1310	6	---	---	---	---	X	X	X	X	X	---
Chiricahua	Entrance Station	AZ	CHIR-ES	CHA467	04-003-8001	32.0092	109.3892	1570	21	---	---	---	---	X	X	X	X	X	X
City of Rocks	Juniper Campground	ID	CIRO-JC	---	16-031-0001	42.0289	113.7292	1914	2	---	---	---	---	X	X	X	X	X	---
Colorado	Maintenance Yard	CO	COLM-MY	---	08-077-1001	39.1067	108.7411	1740	6	---	---	---	---	X	X	X	X	X	---
Craters of the Moon	Visitor Center	ID	CRMO-VC	---	16-023-0101	43.4606	113.5622	1815	20	---	---	---	---	X	X	X	---	X	---
Cumberland Gap	Hensley Settlement	TN	CUGA-HS	---	21-013-1002	36.6719	83.5264	1013	6	---	---	---	---	X	X	X	X	X	---
Death Valley	Park Village	CA	DEVA-PV	---	06-027-0101	36.5092	116.8481	125	19	---	---	---	---	X	X	X	X	---	---
Denali	Headquarters	AK	DENA-HQ	DEN417	02-068-0003	63.7258	148.9633	661	25	---	---	---	---	X	X	X	X	X	X
Devil's Tower	Joyner Ridge Trail	WY	DETO-JR	---	56-011-1013	44.5969	104.7047	1200	4	---	---	---	---	X	X	X	X	X	---
Dinosaur	West Entrance Housing	UT	DINO-WE	---	49-047-1002	40.2917	108.9417	2072	7	---	---	---	---	X	X	X	X	X	---
Everglades	Beard Center	FL	EVER-BC	EVE419	12-086-0030	25.3911	80.6806	2	---	---	---	---	---	X	X	X	X	X	X
Glacier	West Glacier Horse Stables	MT	GLAC-WG	GLR468	30-029-8001	48.5103	113.9956	976	20	---	---	---	---	X	X	X	X	X	X
Grand Canyon	The Abyss	AZ	GRCA-AS	GRC474	04-005-8001	36.0597	112.1822	2073	19	---	---	---	---	X	X	X	X	X	X
Grand Teton	Science School	WY	GRTE-SS	56-039-0008	43.6708	110.5994	2105	1	---	---	---	---	---	X	X	X	X	X	---
Great Basin	Maintenance Yard	NV	GRBA-MY	GRB411	32-033-0101	39.0053	114.2158	2060	19	---	---	---	---	X	X	X	X	X	X
Great Smoky Mountains	Clingmans Dome	TN	GRSM-CD	---	47-155-0102	35.5619	83.4981	2021	19	---	---	---	---	X	X	X	X	X	---
Great Smoky Mountains	Cove Mountain	TN	GRSM-CM	---	47-155-0101	35.6967	83.6086	1243	24	X	---	---	---	X	X	X	X	---	---
Great Smoky Mountains	Look Rock	TN	GRSM-LR	GRS420	47-009-0101	35.6331	83.9422	793	24	---	X	X	X	X	X	X	X	X	X
Hawaii Volcanoes	Observatory/Jaggar Museum	HI	HAVO-OB	---	15-001-0007	19.4203	155.2881	1123	---	X	---	---	---	X	X	X	X	---	---
Hawaii Volcanoes	Visitor Center	HI	HAVO-VC	---	15-001-0005	19.4308	155.2578	1215	---	X	---	---	---	X	X	X	X	X	---
Joshua Tree	Black Rock	CA	JOTR-BR	JOT403	06-071-9002	34.0714	116.3906	1244	19	---	---	---	---	X	X	X	X	X	X
Joshua Tree	Cottonwood Canyon	CA	JOTR-CC	---	06-065-0008	33.7411	115.8206	984	7	---	---	---	---	X	X	X	X	X	---
Joshua Tree	Pinto Wells	CA	JOTR-PW	---	06-065-1004	33.9397	115.4108	326	6	---	---	---	---	X	X	X	X	X	X
Kings Mountain	Brown's Mountain	SC	KIMO-BM	---	45-021-0003	35.1314	81.405	340	1	---	---	---	---	X	X	X	X	X	---
Lassen Volcanic	Manzanita Lake Fire Station	CA	LAVO-ML	LAV410	06-089-3003	40.5403	121.5764	1756	25	---	---	---	---	X	X	X	X	X	X
Little River Canyon	Canyon High	AL	LIRI-CH	---	---	34.3669	85.6642	372	2	---	---	---	---	X	X	X	---	---	---
Lyndon B. Johnson	Hay Barn	TX	LYJO-HB	---	48-171-0001	30.2625	98.6292	470	1	---	---	---	---	X	X	X	X	X	---
Mammoth Cave	Houchin Meadow	KY	MACA-HM	MAC426	21-061-0501	37.1864	86.0411	258	16	X	X	X	---	X	X	X	X	X	X
Mesa Verde	Resource Management Area	CO	MEVE-RM	MEV405	08-083-0101	37.1983	108.4903	2165	19	---	---	---	---	X	X	X	X	X	X

Table 1. 2011 Site specifications (continued).

National Park Unit	Site Name	State	NPS Abbr.	CASTNet Abbr.	AQS ID Number	Latitude (degrees north)	Longitude (degrees west)	Elev. (m)	O ₃ Years ^a	SO ₂	CO	NO _x	PM	WS/WD	TMP	RH	RNF	SOL	Filter Pack ^b
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)																			
<u>Mojave</u>	Keiso Mountains	CA	MOJA-KM	---	06-071-1001	35.1019	115.7767	1212	7	---	---	---	---	X	X	X	X	X	---
Mount Rainier	Tahoma Woods	WA	MORA-TW	MOR409	53-053-1010	46.7583	122.1244	415	21	---	---	---	---	X	X	X	X	X	X
<u>Olympic</u>	Deer Park	WA	OLYM-DP	---	53-009-0016	47.9492	123.2653	1607	3	---	---	---	---	X	X	X	X	X	---
Petrified Forest	South Entrance	AZ	PEFO-SE	PET427	04-017-0119	34.8225	109.8919	1723	10	---	---	---	---	X	X	X	X	X	X
Pinnacles	SW of East Entrance Station	CA	PINN-ES	PIN414	06-069-0003	36.485	121.1556	335	25	---	---	---	---	X	X	X	X	X	X
Rocky Mountain	Long's Peak	CO	ROMO-LP	ROM406	08-069-0007	40.2778	105.5453	2743	27	---	---	---	---	X	X	X	X	X	X
<u>Russell Cave</u>	Visitor Center	AL	RUCA-VC	---	---	34.9811	85.81	215	2	---	---	---	---	X	X	X	X	X	---
<u>Scotts Bluff</u>	Visitor Center	NE	SCBL-VC	---	31-157-0005	41.8294	103.708	1255	2	---	---	---	---	X	X	X	X	X	---
Sequoia and Kings Canyon	Ash Mountain	CA	SEKI-AS	SEK430	06-107-0009	36.4894	118.8292	457	13	---	---	---	X	X	X	X	X	X	X
Sequoia and Kings Canyon	Lower Kaweah	CA	SEKI-LK	---	06-107-0006	36.5658	118.7772	1890	28	---	---	---	---	X	X	X	X	X	---
Shenandoah	Big Meadows	VA	SHEN-BM	SHN418	51-113-0003	38.5231	78.4347	1073	29	---	---	---	---	X	X	X	X	X	X
Voyageurs	Sullivan Bay	MN	VOYA-SB	VOY413	27-137-0034	48.4128	92.8292	429	16	---	---	---	---	X	X	X	X	X	X
Yellowstone	Old Faithful	WY	YELL-OF	---	56-039-1012	44.4569	110.8314	2246	---	---	X	---	X	X	X	X	---	---	---
Yellowstone	Water Tank	WY	YELL-WT	YEL408	56-039-1011	44.5597	110.4006	2400	16	---	---	---	---	X	X	X	X	X	X
<u>Yosemite</u>	School Yard	CA	YOSE-SY	---	06-043-1004	37.7478	119.5917	1234	6	---	---	---	---	X	X	X	X	X	---
Yosemite	Turtleback Dome	CA	YOSE-TD	YOS404	06-043-0003	37.7133	119.7061	1605	19	---	---	---	---	X	X	X	X	X	X
Zion	Dalton's Wash	UT	ZION-DW	---	49-053-0130	37.1983	113.1506	1213	8	---	---	---	X	X	X	X	X	X	---
# active park units: 40 # active park sites: 48																			
Sites operated by the NPS for the Bureau of Land Management																			
Meeker	Plant Science Center	CO	MEEK-PS	---	08-103-0005	40.0039	107.8475	1994	2	---	---	X	X	X	X	X	X	X	---
Rangely	Golf Course	CO	RANG-GC	---	08-103-0006	40.0869	108.7614	1655	2	---	---	X	X	X	X	X	X	X	---
# active units: 2 # active sites: 2																			
Sites operated by the NPS for the U.S. Forest Service																			
Walden	Chandler Ranch	CO	WALD-CR	---	08-057-0003	40.8822	106.3061	2417	1	---	X	---	---	X	X	---	---	X	---
# active units: 1 # active sites: 1																			
Sites operated by cooperating state agencies																			
Acadia	Cadillac Mountain	ME	ACAD-CM	---	23-009-0102	44.4083	68.2461	37	17	---	---	---	---	X	X	X	---	---	---
Acadia	McFarland Hill	ME	ACAD-MH	ACA416	23-009-0103	44.3769	68.2608	158	14	---	---	---	X	X	X	X	X	X	X
Badlands	Visitor Center	SD	BADL-VC	---	46-071-0001	43.7436	101.9414	739	12	---	---	---	X	---	---	---	---	---	---
Cape Cod	Cape Cod	MA	CACO-XX	---	25-001-0002	41.9758	70.0247	41	25	---	---	---	---	X	X	X	---	---	---
Chamizal	Chamizal	TX	CHAM-XX	---	48-141-0044	31.7656	106.455	1128	20	---	---	---	---	X	X	X	---	---	---

Table 1. 2011 Site specifications (continued).

National Park Unit	Site Name	State	NPS Abbr.	CASTNet Abbr.	AQS ID Number	Latitude (degrees north)	Longitude (degrees west)	Elev. (m)	O ₃ Years ^a	SO ₂	CO	NO _x	PM	WS/WD	TMP	RH	RNF	SOL	Filter Pack ^b
Sites operated by cooperating state agencies																			
Congaree	Congaree Bluff	SC	COSW-BL	---	45-079-0021	33.8147	80.7811	34	12	X	---	---	---	---	---	---	---	---	---
Cowpens	State Monitor	SC	COWP-SM	---	45-021-0002	35.1303	87.8164	297	24	---	---	---	---	---	---	---	---	---	---
Everglades	Cutler Road	FL	EVER-CR	---	12-086-0029	25.5861	80.3269	4	27	---	---	---	---	---	---	---	---	---	---
Great Smoky Mountains	Cades Cove	TN	GRSM-CC	---	47-009-0102	35.6042	83.7831	564	19	---	---	---	---	X	X	X	X	X	X
Great Smoky Mountains	Purchase Knob	NC	GRSM-PK	---	37-087-0036	35.59	83.0775	1500	15	---	---	---	---	---	---	---	---	---	---
Indiana Dunes	Ammunition Bunker	IN	INDU-AB	---	18-089-0022	41.7169	86.9075	187	19	---	---	---	X	X	X	X	---	X	---
Mount Rainier	Jackson Visitor's Center	WA	MORA-JV	---	53-053-0012	46.7853	121.7378	1615	14	---	---	---	---	---	---	---	---	---	---
Saguaro	East	AZ	SAGU-EA	---	04-019-0021	32.1744	110.7364	938	20	---	---	---	---	---	---	---	---	---	---
Theodore Roosevelt	Painted Canyon Visitor Cntr	ND	THRO-VC	THR422	38-007-0002	46.8947	103.3778	850	14	X	---	---	X	X	X	X	X	X	X
Wind Cave	Visitor Center	SD	WICA-VC	WNC429	46-033-0132	43.5578	103.4839	1292	8	---	---	---	X	X	X	X	X	X	X
Yellowstone	West Yellowstone	MT	YELL-WS	---	30-031-0017	44.6569	111.0894	2030	---	---	X	X	X	X	X	---	---	---	---
Yosemite	Village	CA	YOSE-VI	---	06-043-1001	37.7458	119.6028	1216	---	---	---	---	X	---	---	---	---	---	---
# active park units: 15 # active park sites: 17																			

^a The values in this column represent the number of years an ozone analyzer has been operational at the site.

^b A filter pack is a part of the CASTNet network and is used to measure dry deposition using the "inferential method." This method combines air quality concentration data with meteorological measurements and land use functions to compute deposition velocities. Ambient air is drawn across the filter at either 3.0 or 1.5 liters per minute. The filter is then analyzed in a lab to yield weekly average concentrations of particulate sulfate (SO₄²⁻), particulate nitrate (NO₃⁻), particulate ammonium (NH₄⁺), sulfur dioxide (SO₂), and nitric acid (HNO₃). In some cases, the positive ions Na⁺, K⁺, Ca²⁺, and Mg²⁺ are also measured from the filter samples.

Operating agency key: plain text = site operated by the National Park Service, Bureau of Land Management, or U.S. Forest Service
italics = site operated by a state agency
underline = site operated by the National Park Service, but consisting of non-EPA certified portable instrumentation

Parameter key:
O₃ = ozone (ppb)
SO₂ = sulfur dioxide (ppb)
CO = carbon monoxide (ppm)
NO_x = oxides of nitrogen (ppb)
PM = particulate matter (µg/m³)
WS = wind speed (m/s)
WD = wind direction (degrees)
TMP = ambient temperature (degrees C)
RH = relative humidity (%)
RNF = precipitation (mm/hr)
WET = wetness (% on)
SOL = solar radiation (watts/m²)

Note: Dashed lines indicate parameter not measured at that site.

Table 2. 2011 Summary of 8-hour average ozone concentrations (ppb).

National Park Unit	Site Name	Valid Number of Days	1 st Highest	2 nd Highest	3 rd Highest	4 th Highest ^a	5 th Highest	# Days with 8-Hour Average O ₃ Values ≥76 ppb ^a
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)								
Big Bend	K-Bar Ranch Road	342	86	84	84	80	80	7
Canyonlands	Island in the Sky	346	73	72	71	69	68	0
Chiricahua	Entrance Station	342	76	75	75	75	74	1
Craters of the Moon	Visitor Center	358	68	64	63	63	62	0
Death Valley	Park Village	352	79	77	76	75	75	3
Denali	Headquarters	363	58	54	53	53	53	0
Glacier	West Glacier Horse Stables	355	58	57	55	55	55	0
Grand Canyon	The Abyss	338	78	77	75	74	74	2
Grand Teton	Science School	126	57	56	56	54	52	0
Great Basin	Maintenance Yard	357	75	75	73	72	71	0
Great Smoky Mountains	Clingmans Dome	179	86	81	80	79	74	4
Great Smoky Mountains	Cove Mountain	360	86	80	78	78	77	8
Great Smoky Mountains	Look Rock	352	87	85	85	83	81	12
Joshua Tree	Black Rock	359	104	98	96	91	90	56
Joshua Tree	Cottonwood Canyon	228	78	77	77	76	76	5
Lassen Volcanic	Manzanita Lake Fire Station	346	66	65	65	65	64	0
Mammoth Cave	Houchin Meadow	356	73	72	72	71	69	0
Mesa Verde	Resource Management Area	363	78	72	70	70	70	1
Mount Rainier	Tahoma Woods	362	56	53	52	51	51	0
Petrified Forest	South Entrance	358	72	70	70	69	69	0
Pinnacles	SW of East Entrance Station	357	73	71	69	69	67	0
Rocky Mountain	Long's Peak	362	80	78	78	77	77	8
Sequoia and Kings Canyon	Ash Mountain	364	103	101	100	98	98	87
Sequoia and Kings Canyon	Lower Kaweah	354	84	83	83	81	81	31
Shenandoah	Big Meadows	354	76	76	75	72	71	2
Voyageurs	Sullivan Bay	346	63	60	60	59	58	0
Yellowstone	Water Tank	353	67	67	67	66	66	0
Yosemite	Turtleback Dome	350	83	79	79	78	78	7
Zion	Dalton's Wash	360	73	72	72	72	71	0
Sites operated by the NPS for the Bureau of Land Management								
Meeker	Plant Science Center	358	64	63	62	62	62	0
Rangely	Golf Course	358	88	88	81	72	69	3
Sites operated by the NPS for the U.S. Forest Service								
Walden	Chandler Ranch	81	47	47	45	45	45	0
Sites operated by cooperating state agencies								
Acadia	Cadillac Mountain	174	92	78	74	74	67	2
Acadia	McFarland Hill	359	74	68	66	66	64	0
Badlands	Visitor Center	359	55	53	52	52	52	0
Cape Cod	Cape Cod	230	74	73	71	68	66	0
Chamizal	Chamizal	361	82	77	76	70	70	3
Congaree	Congaree Bluff	272	66	62	62	62	61	0
Cowpens	State Monitor	253	89	73	71	70	68	1
Everglades	Cutler Road	348	67	66	62	62	61	0
Great Smoky Mountains	Cades Cove	240	71	68	68	68	67	0

Table 2. 2011 Summary of 8-hour average ozone concentrations (ppb) (continued).

National Park Unit	Site Name	Valid Number of Days	1 st Highest	2 nd Highest	3 rd Highest	4 th Highest ^a	5 th Highest	# Days with 8-Hour Average O ₃ Values ≥76 ppb ^a
Sites operated by cooperating state agencies								
<i>Great Smoky Mountains</i>	Purchase Knob	208	77	72	67	66	66	1
<i>Indiana Dunes</i>	Ammunition Bunker	178	83	67	66	66	64	1
<i>Mount Rainier</i>	Jackson Visitor's Center	317	60	56	54	53	53	0
<i>Saguaro</i>	East	364	80	78	78	75	74	3
<i>Theodore Roosevelt</i>	Painted Canyon Visitor Cntr	298	59	59	58	57	56	0
<i>Wind Cave</i>	Visitor Center	362	60	60	60	60	59	0
Portable ozone monitoring systems (POMS)^b								
<u>Carlsbad Caverns</u>	Maintenance Area	182	75	75	72	70	70	0
<u>City of Rocks</u>	Juniper Campground	192	62	60	60	59	58	0
<u>Colorado</u>	Maintenance Yard	263	70	69	68	68	67	0
<u>Cumberland Gap</u>	Hensley Settlement	148	68	66	66	65	65	0
<u>Devil's Tower</u>	Joyner Ridge Trail	151	63	57	57	57	56	0
<u>Dinosaur</u>	West Entrance Housing	347	106	106	103	90	88	8
<u>Joshua Tree</u>	Pinto Wells	326	77	76	76	75	75	3
<u>Kings Mountain</u>	Brown's Mountain	146	88	81	74	74	72	2
<u>Little River Canyon</u>	Canyon High	195	81	73	66	66	65	1
<u>Lyndon B. Johnson</u>	Hay Barn	182	74	74	70	70	69	0
<u>Mojave</u>	Kelso Mountains	187	79	78	78	77	77	6
<u>Olympic</u>	Deer Park	63	58	58	55	53	50	0
<u>Russell Cave</u>	Visitor Center	208	71	69	67	62	60	0
<u>Scotts Bluff</u>	Visitor Center	135	66	63	63	63	62	0
<u>Yosemite</u>	School Yard	157	66	62	61	58	57	0

^a The primary and secondary National Ambient Air Quality Standard for ozone is 0.075 ppm over an 8-hour period. (An exceedance of the standard occurs when an 8-hour average ozone concentration is greater than or equal to 76 ppb. A violation of the standard occurs when the 3-year average of the fourth highest daily maximum 8-hour average ozone concentration equals or exceeds 76 ppb.) Exceedances of the standard are highlighted here in orange or red.

^b The Gaseous Pollutant Monitoring Program Portable Ozone Monitoring Systems (POMS) do not meet EPA standards for regulatory monitoring. However, ozone summary statistics from portable systems can be compared to EPA standards for reference purposes.

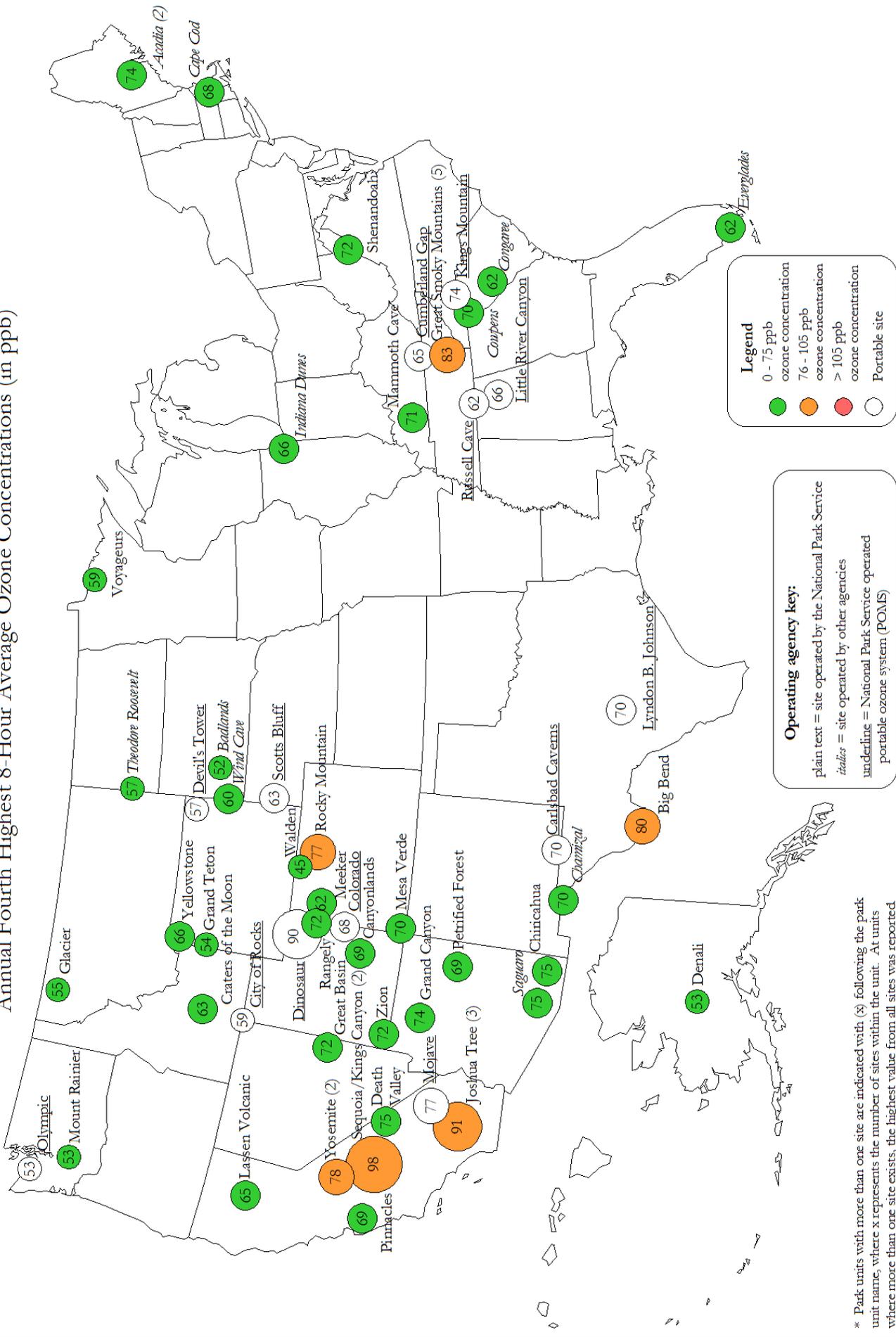
Note: The color coding break points follow the color categories used on the EPA's AIRNow Web Site (<http://www.airnow.gov>).

Operating agency key: plain text = site operated by the National Park Service, Bureau of Land Management, or U.S. Forest Service
italics = site operated by a state agency
underline = site operated by the National Park Service, but consisting of non-EPA certified portable instrumentation

Bold = Ozone summary statistics for POMS are highlighted bold where exceedances occurred. These sites should be compared to EPA standards for reference purposes only.

Color shading key: 4th highest 8-hour average  = 76 - 104 ppb ozone concentration # days with 8-hour average ≥76 ppb  = 4 - 10 days
 ≥ 105 ppb ozone concentration  > 10 days

Annual Fourth Highest 8-Hour Average Ozone Concentrations (in ppb)



* Park units with more than one site are indicated with (x) following the park unit name, where x represents the number of sites within the unit. At units where more than one site exists, the highest value from all sites was reported.

13 Figure 3. 2011 Annual fourth highest daily maximum 8-hour average ozone concentrations (in ppb).

Number of Days with Daily Maximum 8-hour Average Ozone Values ≥ 76 ppb

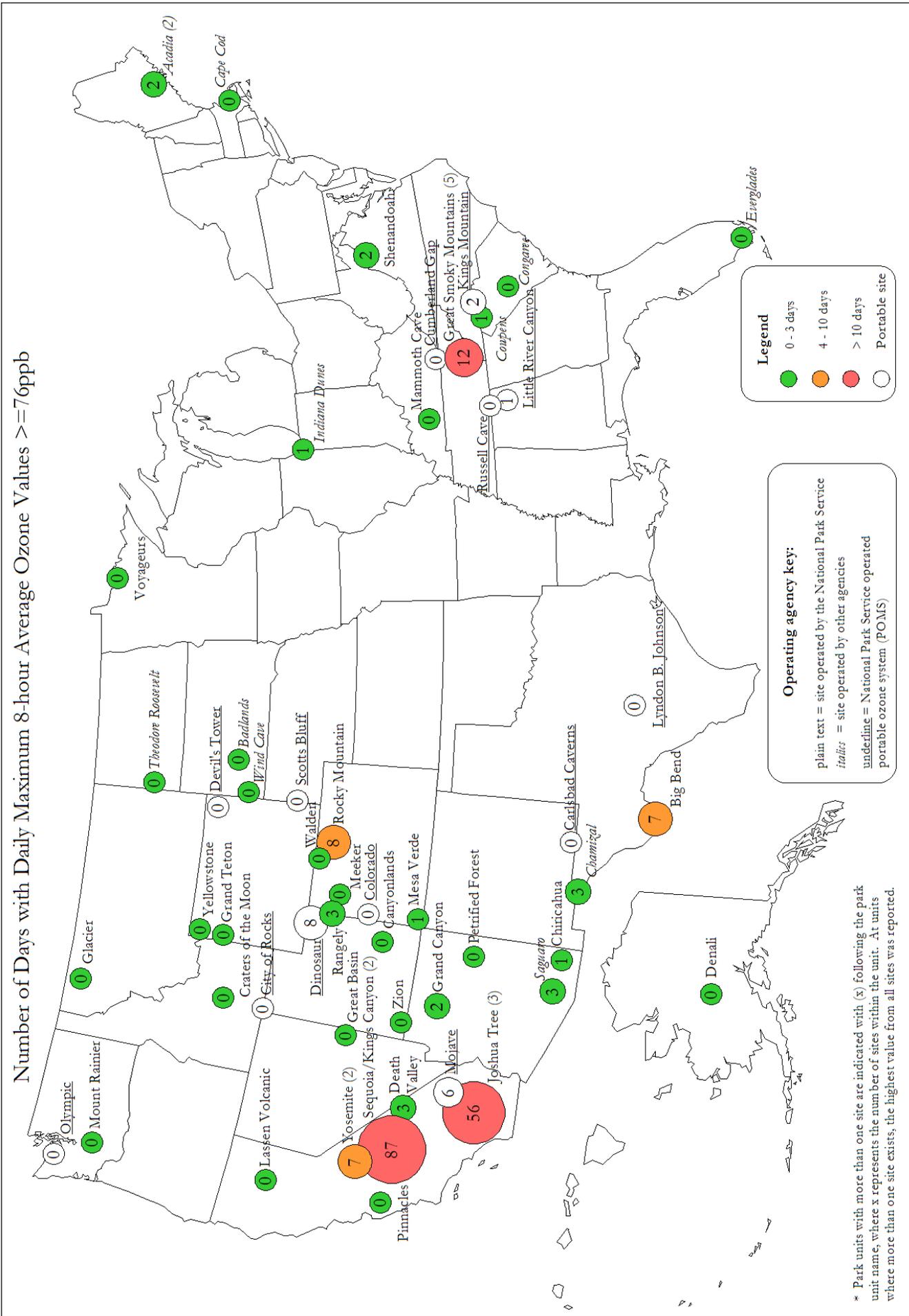
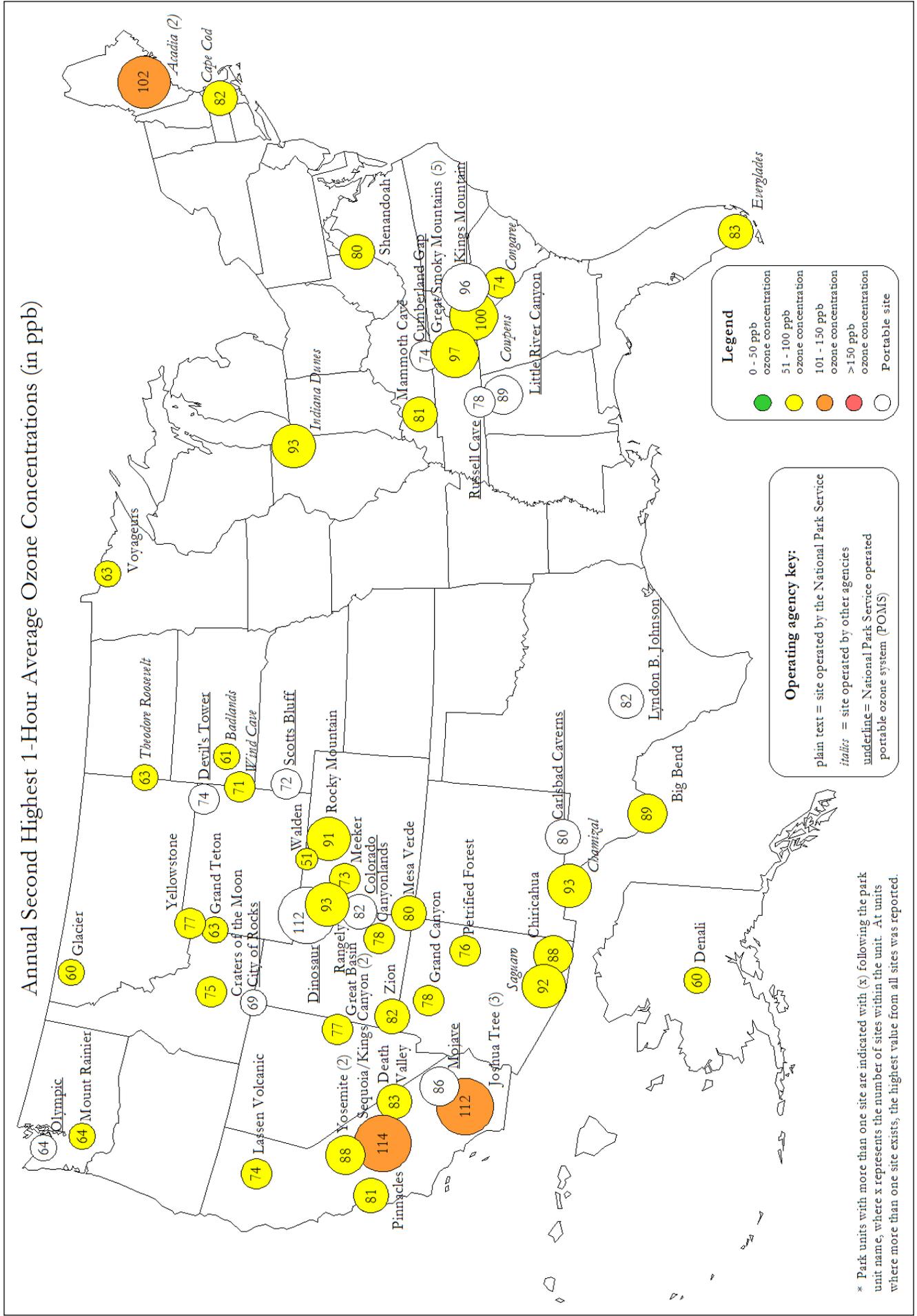


Figure 4. 2011 Annual number of days with daily maximum 8-hour average ozone values ≥ 76 ppb.



* Park units with more than one site are indicated with (x) following the park unit name, where x represents the number of sites within the unit. At units where more than one site exists, the highest value from all sites was reported.

Figure 5. 2011 Annual second highest 1-hour average ozone concentrations (in ppb).

2011 GPMP Data Summary

Table 3. 2011 Ozone violation summary - primary standard^{a,b}.

National Park Unit	Site Name	2009–2011	2008-2010	2007-2009	2006–2008	2005–2007	2004–2006	2003–2005	2002–2004
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)									
Big Bend	K-Bar Ranch Road	69	64	66	66	66	63	63	62
Canyonlands	Island in the Sky	68	68	70	71	70	70	71	72
Chiricahua	Entrance Station	70	68	66	69	71	72	71	71
Craters of the Moon	Visitor Center	61	62	(64)	(67)	(67)	---	---	67
Death Valley	Park Village	71	72	77	81	84	82	81	80
Denali	Headquarters	53	58	58	58	52	51	52	53
Glacier	West Glacier Horse Stables	51	51	51	53	55	54	56	55
Grand Canyon	The Abyss	69	68	68	70	72	73	74	74
Grand Teton	Science School	(54)	---	---	---	---	---	---	---
Great Basin	Maintenance Yard	70	69	71	72	73	72	72	72
Great Smoky Mountains	Clingmans Dome	(75)	(76)	(79)	(84)	(83)	(80)	(79)	(87)
Great Smoky Mountains	Cove Mountain	75	76	79	82	82	77	78	86
Great Smoky Mountains	Look Rock	77	77	79	85	86	84	86	91
Joshua Tree	Black Rock	93	98	100	104	103	103	105	106
Joshua Tree	Cottonwood Canyon	(78)	(81)	(80)	(79)	(66)	(62)	(45)	---
Lassen Volcanic	Manzanita Lake Fire Station	64	70	74	77	72	69	68	71
Mammoth Cave	Houchin Meadow	70	70	72	74	76	72	73	77
Mesa Verde	Resource Management Area	68	68	69	71	73	73	70	68
Mount Rainier	Tahoma Woods	54	55	56	58	(56)	(58)	(61)	63
Petrified Forest	South Entrance	66	67	(67)	(70)	(70)	(70)	(71)	(66)
Pinnacles	SW of East Entrance Station	70	76	77	79	74	75	76	81
Rocky Mountain	Long's Peak	74	73	74	76	76	74	78	82
Sequoia and Kings Canyon	Ash Mountain	96	(101)	(103)	(105)	(103)	(103)	(105)	(105)
Sequoia and Kings Canyon	Lower Kaweah	79	86	90	96	95	96	97	101
Shenandoah	Big Meadows	71	73	73	75	76	77	(80)	82
Voyageurs	Sullivan Bay	62	(62)	(61)	(61)	(65)	64	66	64
Yellowstone	Water Tank	65	64	64	66	64	63	61	63
Yosemite	Turtleback Dome	77	83	86	(88)	85	86	88	90
Zion	Dalton's Wash	69	69	69	71	78	79	(82)	(74)
# park units with violations (0.08 ppm standard):				3	4	4	3	4	4
# sites with violations:				4	5	5	4	5	7
# park units with violations (0.075 ppm standard):		4	5						
# sites with violations:		6	9						
Sites operated by the NPS for the Bureau of Land Management									
Meeker	Plant Science Center	(64)	(66)	---	---	---	---	---	---
Rangely	Golf Course	(62)	(58)	---	---	---	---	---	---
# units with violations (0.08 ppm standard):				---	---	---	---	---	---
# sites with violations:				---	---	---	---	---	---
# units with violations (0.075 ppm standard):		0	0						
# sites with violations:		0	0						

Table 3. 2011 Ozone violation summary - primary standard^{a,b} (continued).

National Park Unit	Site Name	2009–2011	2008–2010	2007–2009	2006–2008	2005–2007	2004–2006	2003–2005	2002–2004
Sites operated by cooperating state agencies									
<i>Acadia</i>	Cadillac Mountain	74	74	78	79	82	80	82	88
<i>Acadia</i>	McFarland Hill	69	69	73	72	74	71	74	80
<i>Badlands</i>	Visitor Center	54	54	56	62	68	67	(66)	(64)
<i>Cape Cod</i>	Cape Cod	72	74	76	79	84	84	86	88
<i>Chamizal</i>	Chamizal	69	70	71	75	74	73	72	78
<i>Congaree</i>	Congaree Bluff	60	64	66	71	73	72	73	74
<i>Cowpens</i>	State Monitor	66	69	67	74	73	74	75	80
<i>Everglades</i>	Cutler Road	62	67	69	72	69	68	55	(65)
<i>Great Smoky Mountains</i>	Cades Cove	68	69	69	72	70	67	(67)	73
<i>Great Smoky Mountains</i>	Purchase Knob	67	72	74	77	77	75	78	82
<i>Indiana Dunes</i>	Ammunition Bunker	62	(61)	(68)	73	82	75	76	(70)
<i>Mount Rainier</i>	Jackson Visitor's Center	53	(52)	(56)	(59)	61	(60)	(59)	---
<i>Saguaro</i>	East	70	69	71	74	76	76	(76)	(73)
<i>Theodore Roosevelt</i>	Painted Canyon Visitor Cntr	56	57	59	63	63	60	59	60
<i>Wind Cave</i>	Visitor Center	59	(59)	62	66	70	(71)	(70)	---
# park units with violations (0.08 ppm standard):				0	0	0	1	1	2
# sites with violations:				0	0	0	1	1	3
# park units with violations (0.075 ppm standard):				0	0				
# sites with violations:				0	0				

^a The new primary and secondary National Ambient Air Quality Standard for ozone is 0.075 ppm over an 8-hour period. (An exceedance of the standard occurs when an 8-hour average ozone concentration is greater than or equal to 76 ppb. A violation of the standard occurs when the 3-year average of the fourth highest daily maximum 8-hour average ozone concentration equals or exceeds 76 ppb.) For reference, values that would violate the new standard are outlined with a black box. The first 3-year period that the new standard will apply to is 2008-2010.

^b The old primary and secondary National Ambient Air Quality Standard for ozone is 0.08 ppm over an 8-hour period. (An exceedance of the standard occurs when an 8-hour average ozone concentration is greater than or equal to 85 ppb. A violation of the standard occurs when the 3-year average of the fourth highest daily maximum 8-hour average ozone concentration equals or exceeds 85 ppb.) Violations of the old standard are highlighted here in orange and red. The old standard applies to all 3-year periods prior to 2008-2010.

Note: The color coding break points follow the color categories used on the EPA's AIRNow Web Site (<http://www.airnow.gov>).

Operating agency key: plain text = site operated by the National Park Service, Bureau of Land Management, or U.S. Forest Service
italics = site operated by a state agency
underline = site operated by the National Park Service, but consisting of non-EPA certified portable instrumentation

Color shading key: 4th highest 8-hour average

= 85 - 104 ppb ozone concentration

≥ 105 ppb ozone concentration

≥ 76 ppb ozone concentration

Note: A number in parenthesis () indicates that data completeness was not met. The 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 fourth-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.

Dashed lines represent no data available at that site.

Table 4. 2011 Summary of indices for resource injury (SUM06 and W126).

National Park Unit	Site Name	O ₃ % Valid	SUM06 ^a (ppm-hr)	W126 ^b (ppm-hr)	Period
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)					
Big Bend	K-Bar Ranch Road	95.6	25	18	April-June
Canyonlands	Island in the Sky	95.7	15	13	May-July
Chiricahua	Entrance Station	94.8	31	10	April-June
Craters of the Moon	Visitor Center	98.5	6	8	April-June
Death Valley	Park Village	98.0	36	23	June-August
Denali	Headquarters	99.7	0	3	March-May
Glacier	West Glacier Horse Stables	98.6	0	3	March-May
Grand Canyon	The Abyss	94.3	26	18	April-June
Grand Teton	Science School	99.5	0	2	September-November
Great Basin	Maintenance Yard	98.8	21	15	June-August
Great Smoky Mountains	Clingmans Dome	99.6	20	14	June-August
Great Smoky Mountains	Cove Mountain	99.6	16	12	June-August
Great Smoky Mountains	Look Rock	98.1	33	22	June-August
Joshua Tree	Black Rock	98.6	56	39	June-August
Joshua Tree	Cottonwood Canyon	73.4	35	22	April-June
Lassen Volcanic	Manzanita Lake Fire Station	97.0	10	8	June-August
Mammoth Cave	Houchin Meadow	98.6	16	12	June-August
Mesa Verde	Resource Management Area	99.7	22	15	June-August
Mount Rainier	Tahoma Woods	99.8	1	1	March-May
Petrified Forest	South Entrance	99.2	21	14	April-June
Pinnacles	SW of East Entrance Station	99.1	10	8	July-September
Rocky Mountain	Long's Peak	99.4	35	24	June-August
Sequoia and Kings Canyon	Ash Mountain	99.7	75	61	July-September
Sequoia and Kings Canyon	Lower Kaweah	97.8	48	34	June-August
Shenandoah	Big Meadows	97.9	20	14	June-August
Voyageurs	Sullivan Bay	96.1	2	5	March-May
Yellowstone	Water Tank	98.1	13	11	April-June
Yosemite	Turtleback Dome	97.4	36	23	July-September
Zion	Dalton's Wash	99.5	24	17	April-June
Sites operated by the NPS for the Bureau of Land Management					
Meeker	Plant Science Center	99.6	6	8	April-June
Rangely	Golf Course	99.5	9	10	June-August
Sites operated by cooperating state agencies					
<i>Acadia</i>	Cadillac Mountain	97.4	4	4	June-August
<i>Acadia</i>	McFarland Hill	98.8	3	3	June-August
<i>Badlands</i>	Visitor Center	98.8	0	2	June-August
<i>Cape Cod</i>	Cape Cod	94.3	4	4	May-July
<i>Chamizal</i>	Chamizal	99.7	17	13	June-August
<i>Congaree</i>	Congaree Bluff	98.3	6	5	April-June
<i>Cowpens</i>	State Monitor	96.8	10	9	June-August
<i>Everglades</i>	Cutler Road	100.0	2	3	March-May
<i>Great Smoky Mountains</i>	Cades Cove	98.6	9	8	April-June
<i>Great Smoky Mountains</i>	Purchase Knob	98.4	6	7	April-June
<i>Indiana Dunes</i>	Ammunition Bunker	99.8	5	4	June-August

Table 4. 2011 Summary of indices for resource injury (SUM06 and W126) (continued).

National Park Unit	Site Name	O ₃ % Valid	SUM06 ^a (ppm-hr)	W126 ^b (ppm-hr)	Period
Sites operated by cooperating state agencies					
<i>Mount Rainier</i>	Jackson Visitor's Center	86.3	0	3	March-May
<i>Saguaro</i>	East	99.6	25	17	May-July
<i>Theodore Roosevelt</i>	Painted Canyon Visitor Center	82.8	1	3	April-June
<i>Wind Cave</i>	Visitor Center	99.7	2	4	May-July
Portable ozone monitoring systems (POMS)					
<u>Carlsbad Caverns</u>	Maintenance Area	99.7	22	15	April-June
<u>City of Rocks</u>	Juniper Campground	99.9	2	6	June-August
<u>Colorado</u>	Maintenance Yard	97.2	18	13	June-August
<u>Cumberland Gap</u>	Hensley Settlement	99.8	4	5	June-August
<u>Devil's Tower</u>	Joyner Ridge Trail	98.7	1	3	June-August
<u>Dinosaur</u>	West Entrance Housing	97.6	18	15	January-March
<u>Joshua Tree</u>	Pinto Wells	90.7	38	23	April-June
<u>Kings Mountain</u>	Brown's Mountain	96.4	13	10	June-August
<u>Little River Canyon</u>	Canyon High	97.2	7	7	June-August
<u>Lyndon B. Johnson</u>	Hay Barn	99.2	8	6	April-June
<u>Mojave</u>	Kelso Mountains	93.6	21	15	April-June
<u>Russell Cave</u>	Visitor Center	99.9	3	4	June-August
<u>Scotts Bluff</u>	Visitor Center	86.8	6	7	June-August
<u>Yosemite</u>	School Yard	99.8	3	4	July-September

^a SUM06 exposure index represents the 0800-2000 hourly ozone concentrations equaling or exceeding 0.06 ppm. The value reported here represents a three-month maximum value during the ozone season. Units are ppm-hr.

^b W126 exposure index represents 0800-2000 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. The value reported here represents a three-month maximum value during the ozone season. Units are ppm-hr. For more information on the W126 exposure index go to <http://www.nature.nps.gov/air/aqbasics/glossary.cfm>.

Note: The SUM06 and W126 are described in further detail on pages 3-4 of this report. For more information see the section titled "Resource Injury Indices."

Operating agency key: plain text = site operated by the National Park Service, Bureau of Land Management, or U.S. Forest Service
 italics = site operated by a state agency
underline = site operated by the National Park Service, but consisting of non-EPA certified portable instrumentation

Annual 3 Month Maximum Sum06 Exposure Index (0800-2000 hourly concentrations)

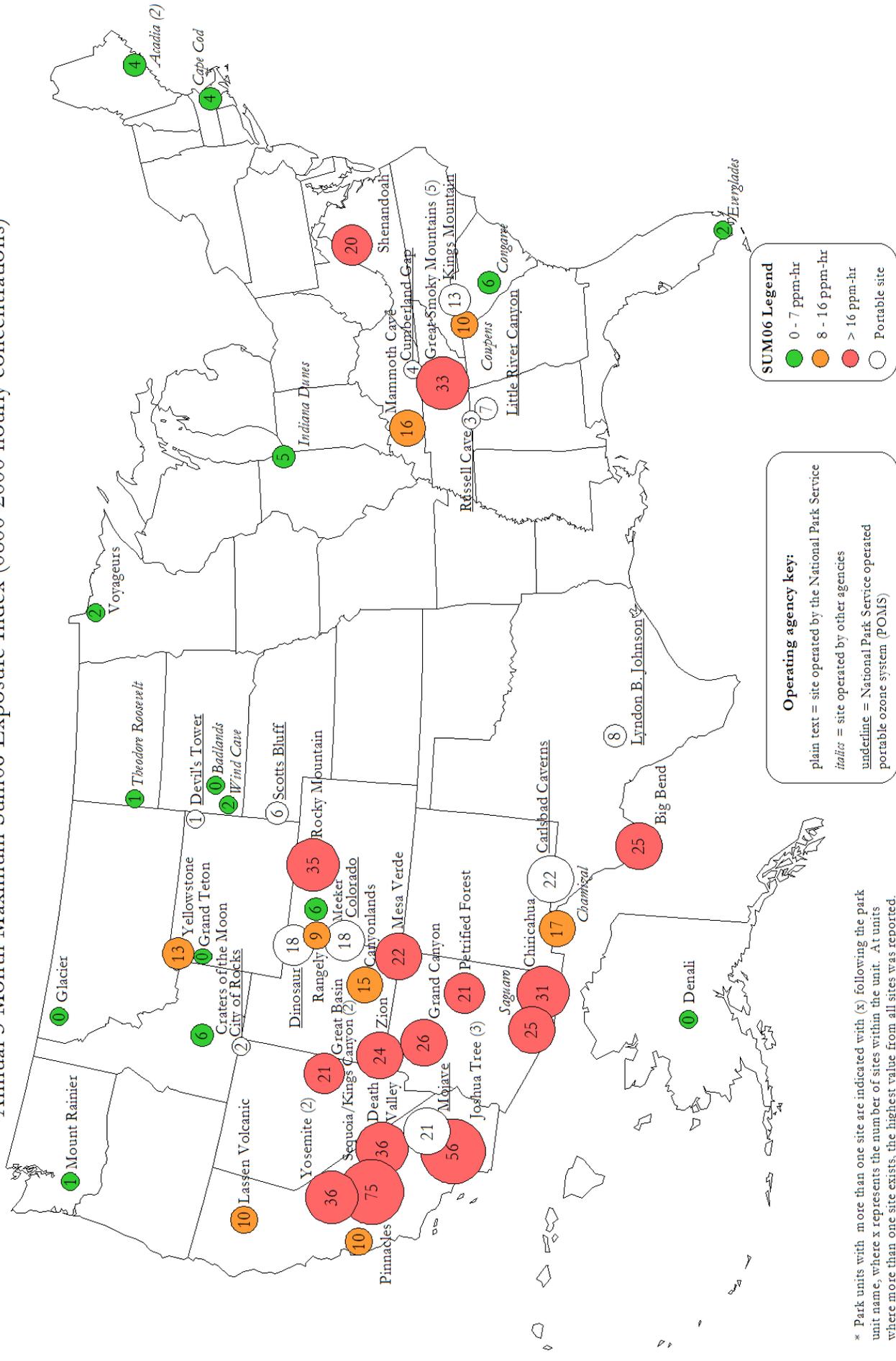


Figure 7. 2011 3-month maximum SUM06 exposure index during the ozone season (0800-2000 hourly concentrations).

Table 5. 2011 Summary of sulfur dioxide data.

National Park Unit	Site Name	Highest Daily Maximum 1-Hour Average Concentration ^a (ppb)					Highest Daily Maximum 3-Hour Average Concentration ^b (ppb)					
		1 st Highest	2 nd Highest	3 rd Highest	4 th Highest	99 th Percentile Value	No. of Days with 1-Hr Average ≥ 76 ppb	1 st Highest	2 nd Highest	3 rd Highest	4 th Highest	No. of Days with 3-Hr Maximum ≥ 550 ppb
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)												
Great Smoky Mountains	Cove Mountain	20	15	14	13	13	0	19	9	9	8	0
Great Smoky Mountains	Look Rock	27	15	13	12	12	0	19	12	9	8	0
Hawaii Volcanoes *	Observatory / Jaggar Museum	948	771	703	692	771	75	626	613	548	411	2
Hawaii Volcanoes *	Visitor Center	672	601	596	577	710	42	483	453	425	387	0
Mammoth Cave	Houchin Meadow	14	13	12	12	12	0	12	10	9	9	0
Sites operated by cooperating state agencies												
<i>Badlands</i>	Visitor Center	7	6	5	5	5	0	7	5	5	5	0
<i>Congaree</i>	Congaree Bluff	29	22	18	17	17	0	18	14	11	11	0
<i>Indiana Dunes</i>	Ammunition Bunker	74	70	58	58	58	0	60	42	36	35	0
<i>Theodore Roosevelt</i>	Painted Canyon Visitor Ctr	11	7	6	5	5	0	8	4	4	3	0

^a The primary hourly National Ambient Air Quality Standard for sulfur dioxide is a daily maximum 1-hour average of 75 ppb. (An exceedance of the Standard occurs when a daily maximum 1-hour average exceeds 75 ppb. A violation of the Standard occurs when the 3-year average of the 99th percentile of the daily maximum 1-hour average exceeds 75 ppb.)

^b The secondary National Ambient Air Quality Standard for sulfur dioxide is 0.5 ppm over a 3-hour period not to be exceeded more than once per year. (A value greater than 0.5 ppm, 549 ppb, or 1300 µg/m³ exceeds the standard.) (40 CFR 50.5)

* This site collected sulfur dioxide data using an instrument or a range that is not an EPA reference method.

Operating agency key: plain text = site operated by the National Park Service, Bureau of Land Management, or U.S. Forest Service
italics = site operated by a state agency

Color shading key: >34 ppb annual arithmetic mean, > 75 ppb 99th percentile value, or >549 ppb 3-hour average

Table 6. 2011 Summary of carbon monoxide data.

National Park Unit	Site Name	Highest Daily Maximum 1-Hour Average Concentration ^a (ppm)				Highest Daily Maximum 8-Hour Average Concentration ^b (ppm)				No. of Days with 8-Hr Average \geq 9 ppm
		1 st Highest	2 nd Highest	3 rd Highest	4 th Highest	1 st Highest	2 nd Highest	3 rd Highest	4 th Highest	
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)										
Great Smoky Mountains	Look Rock	0.7	0.6	0.6	0.6	0.5	0.4	0.4	0.4	0
Mammoth Cave	Houchin Meadow	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0
Sites operated by cooperating state agencies										
Yellowstone	West Yellowstone	3.6	3.2	3.1	2.4	1.0	0.8	0.7	0.6	0

^a The primary hourly National Ambient Air Quality Standard for carbon monoxide is a daily maximum 1-hour average of 35 ppm. (An exceedance of the Standard occurs when a daily maximum 1-hour average exceeds 35 ppm. A violation of the Standard occurs when a daily maximum 1-hour average exceeds 35 ppm more than once in a calendar year.)

^b The primary National Ambient Air Quality Standard for carbon monoxide is 9 ppm over an 8-hour period. (An exceedance of the Standard occurs when an 8-hour average exceeds 9 ppm. A violation of the Standard occurs when a daily maximum 8-hour average exceeds 9 ppm more than once in a calendar year.) (40 CFR 50.8.)

Operating agency key: plain text = site operated by the National Park Service, Bureau of Land Management, or U.S. Forest Service
italics = site operated by a state agency

Color shading key: ■ >35 ppm 1-hour average or >9 ppm 8-hour average

Table 7. 2011 Summary of nitrogen dioxide data.

National Park Unit	Site Name	Highest Daily Maximum 1-Hour Average Concentrations ^{ab} (ppb)						No. of Days with 1-Hour Average \geq 100 ppb	Annual Arithmetic Mean
		1 st Highest	2 nd Highest	3 rd Highest	4 th Highest	98 th Percentile Value			
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)									
Great Smoky Mountains	Look Rock	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mammoth Cave	Houchin Meadow	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sites operated by the NPS for the Bureau of Land Management									
Meeker	Plant Science Center	5.5	5.1	4.8	4.8	4.4	0	0.8	
Rangely	Golf Course	28.4	27.4	25.9	24.3	22.6	0	3.1	
Sites operated by cooperating state agencies									
<i>Yellowstone</i>	<i>West Yellowstone</i>	82.0	60.0	59.0	57.0	44.0	0	3.3	

^a The primary hourly National Ambient Air Quality Standard for nitrogen dioxide is a daily maximum 1-hour average of 100 ppb. (An exceedance of the Standard occurs when a daily maximum 1-hour average exceeds 100 ppb. A violation of the Standard occurs when the 3-year average of the 98th percentile of the daily maximum 1-hour average exceeds 100 ppb. (40 CFR 50.11.)

^b The primary and secondary annual National Ambient Air Quality Standard for nitrogen dioxide is an annual arithmetic mean of 53 ppb. (An exceedance and violation of the Standard occurs when an annual arithmetic mean of NO₂ concentrations is greater than 53 ppb.) (40 CFR 50.11.)

Operating agency key: plain text = site operated by the National Park Service, Bureau of Land Management, or U.S. Forest Service
italics = site operated by a state agency

Color shading key: > 53 ppb annual arithmetic mean or >100 ppb 98th percentile value

Table 8. 2011 Summary of oxides of nitrogen data.

National Park Unit	Site Name	Highest Daily Maximum 1-Hour Average Concentrations (ppb)				No. of Days with 1-Hour Average \geq 100 ppb
		1 st Highest	2 nd Highest	3 rd Highest	4 th Highest	
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)						
Great Smoky Mountains	Look Rock	48.0	13.0	12.6	12.2	0
Mammoth Cave	Houchin Meadow	29.1	27.8	27.1	23.1	0
Sites operated by the NPS for the Bureau of Land Management						
Meeker	Plant Science Center	9.9	9.1	8.4	7.5	0
Rangely	Golf Course	35.6	34.4	31.7	28.7	0
Sites operated by cooperating state agencies						
<i>Yellowstone</i>	<i>West Yellowstone</i>	140.0	90.0	73.0	73.0	1

Operating agency key: plain text = site operated by the National Park Service, Bureau of Land Management, or U.S. Forest Service
italics = site operated by a state agency

Table 9. 2011 Summary of PM_{2.5} data from reference and equivalency methods.

National Park Unit	Site Name	Sampler Type*	% Valid ^a	Annual Arithmetic Mean ^b (µg/m ³)	Highest Daily 24-Hour Average Concentrations ^c (µg/m ³)					
					1 st Highest	2 nd Highest	3 rd Highest	4 th Highest	98 th Percentile Value	No. of Days with 24-Hour Average >35 µg/m ³
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)										
Great Smoky Mountains	Look Rock	TEOM	98.5	11.0	31	30	28	27	24	0
Hawaii Volcanoes	Observatory / Jaggar Museum	SHARP	72.7	4.3	28	28	27	22	21	0
Sequoia and Kings Canyon	Ash Mountain	BAM	97.7	8.3	67	31	30	30	25	1
Yellowstone	Old Faithful	BAM	99.2	3.3	18	15	14	14	10	0
Zion	Dalton's Wash	FRM or FEM	93.0	4.0	22	21	14	14	12	0
Sites operated by the NPS for the Bureau of Land Management										
Meeker	Plant Science Center	TEOM	61.2	2.8	16	15	11	10	10	0
Rangely	Golf Course	FRM or FEM	95.1	3.5	16	16	14	14	13	0
Sites operated by cooperating state agencies										
<i>Acadia</i>	<i>McFarland Hill</i>	TEOM	98.7	2.3	32	29	17	17	10	0
<i>Badlands</i>	<i>Visitor Center</i>	FRM or FEM	92.9	3.0	19	12	12	11	10	0
<i>Indiana Dunes</i>	<i>Ammunition Bunker</i>	FRM or FEM	78.7	13.7	57	51	34	30	34	2
<i>Theodore Roosevelt</i>	<i>Painted Canyon Visitor Ctr</i>	TEOM	96.3	5.5	17	16	15	13	12	0
<i>Wind Cave</i>	<i>Visitor Center</i>	FRM or FEM	96.7	3.3	13	12	12	12	12	0
<i>Yellowstone</i>	<i>W. Yellowstone State Site</i>	BAM	94.3	1.5	13	13	13	13	11	0
<i>Yosemite</i>	<i>Village</i>	BAM	97.6	8.5	39	32	29	29	25	1

^a At sites operated by an agency other than the National Park Service, the primary responsibility for the operation and data reporting of particulate matter belongs to the operating agency.

^b The primary annual National Ambient Air Quality Standard for PM_{2.5} is an annual arithmetic mean of 15.0 µg/m³. (An exceedance of the standard occurs when an annual arithmetic mean of PM_{2.5} concentrations is greater than 15.0 µg/m³. A violation of the standard occurs when the 3-year average of the weighted annual mean PM_{2.5} concentrations is greater than 15.0 µg/m³ (40 CFR 50.7.)

^c The primary daily National Ambient Air Quality Standard for PM_{2.5} is a 24-hour average concentration of 35 µg/m³. (An exceedance of the standard occurs when a 24-hour average PM_{2.5} concentration is greater than 35 µg/m³. A violation of the standard occurs when the 3-year average of the annual 98th percentile of 24-hour PM_{2.5} concentrations is greater than 35 µg/m³.) (40 CFR 50.7.)

- * TEOM = tapered element oscillating microbalance
- BAM = beta attenuation monitor
- SHARP = synchronized hybrid ambient real-time particulate monitor
- FRM = federal reference method monitor
- FEM = federal equivalent method monitor

Operating agency key: plain text = site operated by the National Park Service, Bureau of Land Management, or U.S. Forest Service
 italics = site operated by a state agency

Color shading key: Annual arithmetic mean > 15 µg/m³
 98th percentile value > 35 µg/m³

Table 10. 2011 Summary of PM₁₀ data from reference and equivalency methods.

National Park Unit	Site Name	Sampler Type*	% Valid ^a	Annual Arithmetic Mean ^b (µg/m ³)	Highest Daily 24-Hour Average Concentrations ^c (µg/m ³)				No. of Days with 24-Hour Average >150 µg/m ³
					1 st Highest	2 nd Highest	3 rd Highest	4 th Highest	
Sites operated by cooperating state agencies									
<i>Badlands</i>	Visitor Center	BAM	97.7	9	50	50	40	30	0
<i>Wind Cave</i>	Visitor Center	BAM	98.8	7	40	30	30	30	0

^a At sites operated by an agency other than the National Park Service, the primary responsibility for the operation and data reporting of particulate matter belongs to the operating agency.

^b The primary annual National Ambient Air Quality Standard for PM₁₀ is an annual arithmetic mean of 50 µg/m³. (An exceedance of the standard occurs when an annual arithmetic mean of PM₁₀ concentrations is greater than 50 µg/m³. A violation of the standard occurs when the 3-year average of the weighted annual mean PM₁₀ concentrations is greater than 50 µg/m³ (40 CFR 50.6.)

^c The primary daily National Ambient Air Quality Standard for PM₁₀ is a 24-hour average concentration of 150 µg/m³. (An exceedance of the standard occurs when a 24-hour average PM₁₀ concentration is greater than 150 µg/m³. A violation of the standard occurs when a 24-hour average concentration greater than 150 µg/m³ occurs more than once in a calendar year.) (40 CFR 50.6.)

* TEOM = tapered element oscillating microbalance
BAM = beta attenuation monitor

Color shading key: >50 µg/m³ annual arithmetic mean, >150 µg/m³ 24-hour average

italics = site operated by a state agency

Table 11. PM₁₀ summary - maximum daily 24-hour average concentration in 2009-2011 (µg/m³)^a.

National Park Unit	Site Name	Sampler Type*	2011	2010	2009
Sites operated by cooperating state agencies					
<i>Badlands</i>	Visitor Center	BAM	50	30	40
<i>Wind Cave</i>	Visitor Center	BAM	40	140	340

^a The primary daily National Ambient Air Quality Standard for PM₁₀ is a 24-hour average concentration of 150 µg/m³. (An exceedance of the standard occurs when a 24-hour average PM₁₀ concentration is greater than 150 µg/m³. A violation of the standard occurs when a 24-hour average concentration greater than 150 µg/m³ occurs more than once in a calendar year.) (40 CFR 50.6.)

* TEOM = tapered element oscillating microbalance
BAM = beta attenuation monitor

Color shading key: > 1 24-hour average concentration >150 µg/m³

italics = site operated by a state agency

Table 12. 2011 Annual summary of selected meteorological data.

National Park Unit	Site Name	Wind Speed (m/s)	Ambient Temperature (degrees C)			Relative Humidity (%)			Precipitation (mm)
		Average	Average	Maximum	Minimum	Average	Maximum	Minimum	Annual Accumulation
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)									
Big Bend	K-Bar Ranch Road	3.8	22.0	40.7	-12.6	31	95	2	58
Canyonlands	Island in the Sky	2.9	11.3	34.0	-19.3	40	96	5	241
Chiricahua	Entrance Station	3.0	15.9	37.2	-16.8	38	100	5	329
Craters of the Moon	Visitor Center	3.5	5.4	31.9	-21.4	56	100	7	---
Denali	Headquarters	1.3	-1.7	24.6	-33.5	66	100	16	166
Everglades	Beard Center	2.1	23.0	33.5	1.7	81	100	31	1024
Glacier	West Glacier Horse Stables	0.9	5.1	31.6	-27.7	73	95	18	914
Grand Canyon	The Abyss	2.8	10.3	31.1	-17.3	43	100	6	332
Grand Teton	Science School	2.5	0.4	29.0	-25.3	67	97	11	66
Great Basin	Maintenance Yard	2.9	8.6	31.5	-21.8	42	95	4	313
Great Smoky Mountains	Cades Cove	1.3	14.5	34.4	-13.4	78	100	16	1655
Great Smoky Mountains	Clingmans Dome	3.5	11.5	21.1	-7.7	85	100	6	995
Great Smoky Mountains	Cove Mountain	4.7	11.6	28.4	-16.5	71	100	5	1131
Great Smoky Mountains	Look Rock	2.4	13.5	30.5	-13.9	71	100	7	1276
Hawaii Volcanoes	Observatory / Jaggar Museum	5.1	15.4	24.6	9.8	89	100	33	844
Hawaii Volcanoes	Visitor Center	3.8	14.8	23.3	1.9	93	100	45	1711
Joshua Tree	Black Rock	3.6	16.1	36.1	-4.8	32	96	2	143
Joshua Tree	Cottonwood Canyon	3.4	21.3	39.2	-4.4	27	100	5	142
Lassen Volcanic	Manzanita Lake Fire Station	1.9	6.0	26.5	-14.5	63	95	6	790
Mammoth Cave	Houchin Meadow	1.9	14.6	36.3	-13.6	71	100	20	1638
Mesa Verde	Resource Management Area	3.1	9.9	31.0	-19.8	43	97	6	341
Mount Rainier	Tahoma Woods	0.9	8.5	31.3	-8.6	84	99	12	1572
Petrified Forest	South Entrance	4.2	12.1	34.3	-18.6	43	95	4	245
Pinnacles	SW of East Entrance Station	2.3	13.5	39.0	-5.8	61	94	5	371
Rocky Mountain	Long's Peak	2.8	4.3	25.3	-33.5	48	100	0	391
Sequoia and Kings Canyon	Ash Mountain	2.4	15.9	36.2	-1.1	56	100	13	530
Sequoia and Kings Canyon	Lower Kaweah	1.7	8.6	26.4	-10.8	62	100	7	714
Shenandoah	Big Meadows	2.1	9.4	28.8	-16.6	72	100	4	1493
Voyageurs	Sullivan Bay	2.5	4.3	31.8	-30.4	71	96	16	497
Yellowstone	Old Faithful	1.8	1.2	27.2	-35.1	69	100	11	---
Yellowstone	Water Tank	1.7	0.8	25.9	-31.5	67	95	13	591
Yosemite	Turtleback Dome	4.0	10.6	28.7	-8.0	51	96	3	---
Zion	Dalton's Wash	4.0	15.7	39.4	-10.3	38	96	3	215
Sites operated by the NPS for the Bureau of Land Management									
Meeker	Plant Science Center	3.5	6.2	31.5	-33.8	59	100	9	459
Rangely	Golf Course	3.0	7.7	34.7	-28.6	55	100	7	122
Sites operated by the NPS for the U.S. Forest Service									
Walden	Chandler Ranch	3.7	-4.7	19.5	-29.7	66	100	9	---
Sites operated by cooperating state agencies									
Acadia	Cadillac Mountain	5.3	13.5	31.6	-4.6	85	100	23	---
Acadia	McFarland Hill	2.9	7.9	33.9	-23.4	78	100	2	917
Cape Cod	Cape Cod	2.5	11.1	35.9	-15.1	72	90	19	---
Chamizal	Chamizal	3.5	20.0	40.7	-15.7	28	97	2	---

Table 12. 2011 Annual summary of selected meteorological data (continued).

National Park Unit	Site Name	Wind Speed (m/s)	Ambient Temperature (degrees C)			Relative Humidity (%)			Precipitation (mm)
		Average	Average	Maximum	Minimum	Average	Maximum	Minimum	Annual Accumulation
Sites operated by cooperating state agencies									
<i>Indiana Dunes</i>	Ammunition Bunker	3.6	10.4	39.5	-22.6	75	100	22	---
<i>Saguaro</i>	East	---	21.3	42.5	-9.0	31	96	3	---
<i>Theodore Roosevelt</i>	Painted Canyon Visitor Cntr	5.2	6.0	35.7	-30.9	67	95	8	442
<i>Wind Cave</i>	Visitor Center	3.2	8.5	35.6	-27.2	56	95	10	493
Portable ozone monitoring systems (POMS) (seasonal)									
<u>Carlsbad Caverns</u>	Maintenance Area	4.7	26.1	39.8	3.1	26	100	3	90
<u>City of Rocks</u>	Juniper Campground	2.4	12.5	33.9	-7.6	50	100	8	149
<u>Colorado</u>	Maintenance Yard	1.6	13.2	35.7	-19.0	42	99	6	217
<u>Cumberland Gap</u>	Hensley Settlement	1.9	19.6	29.6	0.7	82	100	43	603
<u>Devil's Tower</u>	Joyner Ridge Trail	1.4	17.0	37.5	-2.8	62	99	12	346
<u>Dinosaur</u>	West Entrance Housing	1.3	8.2	36.8	-28.8	57	99	9	208
<u>Joshua Tree</u>	Pinto Wells	3.3	23.0	45.9	-2.8	27	95	5	68
<u>Kings Mountain</u>	Brown's Mountain	1.4	24.0	37.0	5.8	70	100	23	347
<u>Little River Canyon</u>	Canyon High	0.8	20.2	35.7	-3.3	81	99	24	---
<u>Lyndon B. Johnson</u>	Hay Barn	1.9	27.1	40.5	2.1	53	100	7	66
<u>Mojave</u>	Kelso Mountains	3.6	23.4	38.8	4.0	26	97	5	31
<u>Olympic</u>	Deer Park	0.9	11.0	27.5	-0.6	66	100	9	27
<u>Russell Cave</u>	Visitor Center	0.6	21.1	36.9	-0.5	78	100	24	638
<u>Scotts Bluff</u>	Visitor Center	2.5	19.6	38.1	-0.5	55	99	9	113
<u>Yosemite</u>	School Yard	0.7	16.3	34.6	0.1	66	99	9	205

Note: Dashed lines represent no data available for that particular parameter at that site.

Operating agency key: plain text = site operated by the National Park Service, Bureau of Land Management, or U.S. Forest Service
italics = site operated by a state agency
underline = site operated by the National Park Service, but consisting of non-EPA certified portable instrumentation

Data quality tables associated with the data presented in this report can be found at:
<http://ard-request.air-resource.com>. Click "Reports."

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Pinnacles National Monument, California - Southwest of East Entrance Station monitoring site

