National Park Service
U.S. Department of the Interior

Natural Resource Program Center

2008 Data Quality Assurance
National Park Service
Gaseous Pollutant Monitoring Program

This report is provided as a supplement to the National Park Service Gaseous Pollutant Monitoring Program (NPS GPMP) 2008 Annual Data Summary report. All data were validated according to U.S. Environmental Protection Agency (EPA) and NPS protocols. Presented in this report are data collection statistics for all parameters, and precision and accuracy summaries are for ozone data only.

Yellowstone National Park, Wyoming
West Thumb Geyser Basin
Photo by Jessica Ward /
Air Resource Specialists, Inc.

Data Collection

Table 1 presents data collection statistics for each parameter by site and presents the overall network average by parameter. The network average valid data collection for ozone at sites operated by the National Park Service was 94.5%, and for sulfur dioxide was 99.6%.

Table 2 presents a network summary of data collection statistics by parameter. Annual and quarterly network average statistics are presented, along with the number and percentage of sites which met the minimum EPA data collection criteria of 75%. For 2008, 26 of 28 ozone sites and 3 of 3 sulfur dioxide sites met or exceeded the annual EPA criteria at sites operated by the National Park Service.

Table 1. 2008 Data collection statistics.

National Park Unit	Site Name	Parameter Code										
		O_3 % valid[a]	SO_2 % valid[a]	VWD[b] % valid[a]	SWS[c] % valid[a]	TMP % valid[a]	RH % valid[a]	RNF % valid[a]	WET % valid[a]	DTP % valid[a]	SOL % valid[a]	FLOW % valid[a]
Sites operated by the National Park Service												
Big Bend	K-Bar Ranch Road	97.6	---	98.3	98.4	98.6	98.7	98.3	97.6	70.3	98.8	98.9
Canyonlands	Island in the Sky	97.8	---	99.5	99.5	99.5	99.3	98.8	98.9	75.6	99.3	99.8
Chiricahua	Entrance Station	99.2	---	99.7	99.7	99.8	99.5	99.2	98.9	99.7	99.8	99.8
Craters of the Moon	Visitor Center	98.8	---	98.7	98.7	99.0	99.0	---	---	---	98.4	---
Death Valley	Park Village	98.4	---	95.4	95.4	99.1	99.5	98.3	---	---	99.1	---
Denali	Headquarters	98.4	---	99.8	99.8	99.6	99.8	99.7	99.7	99.6	100.0	99.9
Everglades	Beard Center	---	---	98.7	98.7	99.5	97.6	87.0	98.8	98.2	99.6	99.6
Glacier	West Glacier Horse Stables	98.7	---	93.9	93.9	99.4	99.4	99.0	97.1	99.4	74.6	99.4
Grand Canyon	The Abyss	99.1	---	99.5	99.5	43.9	99.7	99.1	95.0	43.9	99.7	99.7
Great Basin	Maintenance Yard	92.7	---	98.5	98.6	58.2	99.0	98.6	98.5	58.2	98.4	99.7
Great Smoky Mountains	Clingmans Dome	99.2	---	99.9	99.9	99.8	95.4	95.7	---	---	99.9	---
Great Smoky Mountains	Cove Mountain	99.3	99.4	98.7	98.7	99.4	99.1	98.3	---	---	---	---
Great Smoky Mountains	Look Rock	99.2	---	99.2	99.2	99.0	98.8	98.8	97.6	97.6	98.7	97.5
Hawaii Volcanoes	Observatory	---	100.0	100.0	100.0	99.9	99.9	99.5	---	---	---	---
Hawaii Volcanoes	Visitor Center	---	99.5	99.5	99.5	98.9	98.9	96.9	---	---	99.6	---
Joshua Tree	Black Rock	98.1	---	99.4	99.4	99.8	99.8	96.8	99.2	99.8	97.8	97.9
Joshua Tree	Cottonwood Canyon	43.3	---	51.0	51.0	51.0	51.0	51.0	---	---	51.0	---
Lassen Volcanic	Manzanita Lake Fire Station	96.4	---	96.7	96.7	97.2	97.2	96.7	74.6	97.2	97.2	97.3
Mammoth Cave	Houchin Meadow	99.9	---	97.2	99.7	98.6	99.0	99.6	99.0	96.9	99.9	100.0
Mesa Verde	Resource Management Area	97.0	---	98.4	98.4	98.9	99.2	98.6	97.7	91.3	99.1	98.5
Mount Rainier	Tahoma Woods	98.7	---	82.2	82.2	99.0	99.5	99.2	99.2	99.0	95.9	99.7
Petrified Forest	South Entrance	93.8	---	99.5	99.5	99.6	99.6	76.1	99.2	99.6	99.1	99.7
Pinnacles	SW of East Entrance Station	98.5	---	96.5	96.5	99.6	97.4	97.5	98.9	99.6	99.7	99.7
Rocky Mountain	Long's Peak	98.8	---	99.2	99.2	97.8	98.7	98.8	90.8	72.1	99.2	99.3
Sequoia and Kings Canyon	Ash Mountain	73.6	---	89.7	89.7	90.2	90.1	75.5	89.4	90.2	90.3	89.8
Sequoia and Kings Canyon	Lower Kaweah	97.0	---	95.6	97.0	97.;1	97.2	94.9	---	---	93.3	---
Shenandoah	Big Meadows	98.6	---	91.9	93.3	98.1	98.4	98.0	97.0	98.0	98.1	98.6
Voyageurs	Sullivan Bay	87.4	---	97.9	97.9	97.9	98.0	98.5	97.3	97.9	98.0	96.6
Yellowstone	Old Faithful	---	---	97.8	97.8	99.9	99.9	---	---	---	---	---
Yellowstone	Water Tank	95.1	---	69.8	69.8	98.0	96.5	97.8	55.0	98.0	98.1	98.8
Yosemite	Turtleback Dome	95.5	---	96.5	96.5	97.2	97.5	95.6	97.1	96.3	97.6	97.6
Zion	Dalton's Wash	98.0	---	99.4	99.4	99.8	99.8	99.2	---	---	99.6	---
Average Network Data Collection		**94.5**	**99.6**	**90.0**	**95.0**	**94.1**	**97.0**	**94.7**	**94.4**	**89.9**	**95.8**	**98.5**
Sites operated by cooperating state agencies												
Acadia	Cadillac Mountain	99.7	---	97.6	97.6	99.5	99.5	---	---	---	---	---
Acadia	McFarland Hill	99.1	---	99.4	99.4	99.6	95.0	99.6	99.8	82.0	99.2	99.7
Badlands	Visitor Center	99.1	99.1	---	---	---	---	---	---	---	---	---
Cape Cod	Cape Cod	97.3	---	86.6	86.6	99.9	99.9	---	---	---	99.9	---
Chamizal	Chamizal	98.0	---	99.8	99.8	99.8	99.8	---	---	---	99.8	---
Congaree	Congaree Bluff	99.0	99.0	---	---	---	---	---	---	---	---	---
Cowpens	State Monitor	97.0	---	---	---	---	---	---	---	---	---	---
Everglades	Cutler Road	97.3	---	---	---	---	---	---	---	---	---	---
Great Smoky Mountains	Cades Cove	99.4	---	95.2	95.2	99.9	99.9	99.5	---	---	99.9	---

Table 1. 2008 Data collection statistics (continued).

National Park Unit	Site Name	Parameter Code										
		O_3 % valid[a]	SO_2 % valid[a]	VWD[b] % valid[a]	SWS[c] % valid[a]	TMP % valid[a]	RH % valid[a]	RNF % valid[a]	WET % valid[a]	DTP % valid[a]	SOL % valid[a]	FLOW % valid[a]
Sites operated by cooperating state agencies												
Great Smoky Mountains	Purchase Knob	95.5	---	---	---	---	---	---	---	---	---	---
Indiana Dunes	Ammunition Bunker	97.7	98.7	98.4	98.7	99.9	99.9	---	---	---	98.1	---
Mount Rainier	Jackson Visitor's Center	52.0	---	---	---	---	---	---	---	---	---	---
Saguaro	Pima County	99.7	---	99.7	99.9	100.0	100.0	---	---	---	99.6	---
Theodore Roosevelt	Painted Canyon Visitor Cntr	99.9	99.7	99.0	99.0	99.5	99.6	99.2	99.3	99.5	99.6	99.8
Wind Cave	Visitor Center	97.3	99.7	81.0	81.0	99.9	83.9	99.6	99.0	99.9	99.9	99.9
Yosemite	Village	---	---	---	---	---	---	---	---	---	---	---
Average Network Data Collection		**98.3**	**99.2**	**95.0**	**95.1**	**99.8**	**97.4**	**99.5**	**99.4**	**93.8**	**99.5**	**99.8**
Portable ozone monitoring systems												
Agate Fossil Beds	Residence Area	80.4	---	---	99.5	99.4	99.5	99.5	---	---	99.5	---
Assateague Island	Maintenance Area	99.8	---	---	99.8	99.9	99.9	99.8	---	---	99.9	---
Carlsbad Caverns	Maintenance Area	94.1	---	---	100.0	100.0	100.0	100.0	---	---	99.9	99.9
Colorado	Maintenance Yard	98.6	---	---	100.0	100.0	100.0	100.0	---	---	100.0	---
Cumberland Gap	Hensley Settlement	98.4	---	---	99.9	78.4	78.8	99.9	---	---	99.9	---
Devil's Tower	Joyner Ridge Trail	96.7	---	---	99.7	99.7	99.7	99.7	---	---	99.7	99.2
Dinosaur	West Entrance Housing	91.1	---	---	99.7	100.0	100.0	100.0	---	---	100.0	99.1
Joshua Tree	Pinto Wells	99.5	---	---	99.6	99.6	99.6	99.6	---	---	99.6	99.3
Mojave	Kelso Mountains	99.9	---	---	99.9	99.9	99.9	99.9	---	---	99.9	---
Natchez Trace Parkway	Dancy Ranger Station	63.6	---	---	99.9	63.9	63.9	99.9	---	---	63.9	---
Olympic	Hurricane Ridge Portable	99.8	---	---	99.2	99.9	99.6	99.9	---	---	99.9	---
Padre Island	Malaquite Visitor Center	83.8	---	---	89.4	89.2	89.1	89.5	---	---	89.1	---
Yosemite	School Yard	85.9	---	---	99.9	99.9	99.9	99.9	---	---	99.8	---
Average Network Data Collection		**91.8**	**---**	**---**	**99.2**	**94.8**	**94.8**	**99.3**	**---**	**---**	**96.5**	**99.4**

[a] The percent is calculated against the number possible. Percent valid can be less than 100% due to routine maintenance, power failures, audits, or other circumstances where the instrument was not available to collect data. Percent valid can also be less than 100% due to influencing factors such as instrument error, operator error, timing problems, flow issues, and other factors that affect instrument operation. When calculating percent valid for O_3 and SO_2, calibration events were removed from the number possible.

[b] Cape Cod reports wind direction as scalar wind direction rather than vector wind direction.

[c] Saguaro reports wind speed as vector wind speed rather than scalar wind speed.

Operating agency key: plain text = site operated by the National Park 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: O_3 = ozone analyzer; SO_2 = sulfur dioxide analyzer; FLOW = filter pack flow rate; VWD = vector wind direction; SWS = scalar wind speed; TMP = ambient temperature; RH = relative humidity; RNF = precipitation; WET = wetness; DTP = delta temperature; SOL = solar radiation

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

Portable ozone monitoring systems typically operate during the summer ozone season only.

Table 2. 2008 Network summary of data collection statistics.

Calendar Quarter	Network Data Collection Statistic[a]	Units	Parameter Code										
			O_3	SO_2	VWD	SWS	TMP	RH	RNF	WET	DTP	SOL	FLOW
Sites operated by the National Park Service													
Annual	Annual average	%	94.5	99.6	94.9	95.0	94.1	97.0	94.7	94.4	89.9	95.8	98.5
	# sites ≥ 75% valid	# sites (%)	26 (93)	3 (100)	30 (94)	30 (94)	29 (91)	31 (97)	29 (97)	20 (91)	18 (82)	27 (93)	22 (100)
	# sites < 75% valid	# sites (%)	2 (7)	0 (0)	2 (6)	2 (6)	3 (9)	1 (3)	1 (3)	2 (9)	4 (18)	2 (7)	0 (0)
1	Quarterly average	%	90.3	95.9	93.1	93.2	93.7	95.8	94.4	91.8	91.8	95.1	99.3
	# sites ≥ 75% valid	# sites (%)	25 (93)	3 (100)	29 (94)	29 (94)	29 (94)	30 (97)	28 (97)	20 (91)	20 (91)	27 (96)	22 (100)
	# sites < 75% valid	# sites (%)	2 (7)	0 (0)	2 (6)	2 (6)	2 (6)	1 (3)	1 (3)	2 (9)	2 (9)	1 (4)	0 (0)
2	Quarterly average	%	96.5	96.3	97.0	97.3	92.7	98.7	97.2	92.1	79.9	98.3	99.0
	# sites ≥ 75% valid	# sites (%)	27 (96)	3 (100)	32 (100)	32 (100)	30 (94)	32 (100)	30 (100)	20 (91)	17 (77)	29 (100)	22 (100)
	# sites < 75% valid	# sites (%)	1 (4)	0 (0)	0 (0)	0 (0)	2 (6)	0 (0)	0 (0)	2 (9)	5 (23)	0 (0)	0 (0)
3	Quarterly average	%	93.4	95.6	94.4	94.6	92.5	95.5	93.8	94.7	90.7	93.3	96.5
	# sites ≥ 75% valid	# sites (%)	26 (93)	3 (100)	30 (94)	30 (94)	29 (91)	30 (94)	27 (90)	21 (96)	20 (91)	26 (90)	21 (96)
	# sites < 75% valid	# sites (%)	2 (7)	0 (0)	2 (6)	2 (6)	3 (9)	2 (6)	3 (10)	1 (5)	2 (9)	3 (10)	1 (5)
4	Quarterly average	%	97.8	95.0	94.9	95.0	97.4	98.0	93.3	98.8	97.2	96.6	99.4
	# sites ≥ 75% valid	# sites (%)	27 (96)	3 (100)	30 (94)	30 (94)	30 (94)	31 (97)	27 (90)	22 (100)	21 (96)	27 (93)	22 (100)
	# sites < 75% valid	# sites (%)	1 (4)	0 (0)	2 (6)	2 (6)	2 (6)	1 (3)	3 (10)	0 (0)	1 (5)	2 (7)	0 (0)
Sites operated by cooperating state agencies													
Annual	Annual average	%	94.7	99.2	95.0	95.1	99.8	97.4	99.5	99.4	93.8	99.5	99.8
	# sites ≥ 75% valid	# sites (%)	14 (93)	5 (100)	9 (100)	9 (100)	9 (100)	9 (100)	4 (100)	3 (100)	3 (100)	8 (100)	3 (100)
	# sites < 75% valid	# sites (%)	1 (7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
1	Quarterly average	%	89.6	99.5	93.2	93.2	99.8	99.8	99.3	99.6	96.6	99.8	99.7
	# sites ≥ 75% valid	# sites (%)	10 (91)	5 (100)	7 (88)	7 (88)	8 (100)	8 (100)	4 (100)	3 (100)	3 (100)	8 (100)	3 (100)
	# sites < 75% valid	# sites (%)	1 (9)	0 (0)	1 (12)	1 (12)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2	Quarterly average	%	93.4	99.2	94.6	94.8	99.9	98.0	99.5	99.0	94.7	99.4	99.8
	# sites ≥ 75% valid	# sites (%)	14 (93)	5 (100)	8 (89)	8 (89)	9 (100)	9 (100)	4 (100)	3 (100)	3 (100)	8 (100)	3 (100)
	# sites < 75% valid	# sites (%)	1 (7)	0 (0)	1 (11)	1 (11)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
3	Quarterly average	%	97.2	98.9	99.4	99.4	99.8	95.1	99.5	99.4	84.8	99.3	100.0
	# sites ≥ 75% valid	# sites (%)	15 (100)	5 (100)	9 (100)	9 (100)	9 (100)	9 (100)	4 (100)	3 (100)	2 (67)	8 (100)	3 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (33)	0 (0)	0 (0)
4	Quarterly average	%	97.8	99.3	92.3	92.4	99.7	96.7	99.6	99.5	99.1	99.5	99.7
	# sites ≥ 75% valid	# sites (%)	11 (100)	5 (100)	7 (88)	7 (88)	8 (100)	8 (100)	4 (100)	3 (100)	3 (100)	8 (100)	3 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	1 (12)	1 (12)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 2. 2008 Network summary of data collection statistics (continued).

Calendar Quarter	Network Data Collection Statistic[a]	Units	Parameter Code										
			O_3	SO_2	VWD	SWS	TMP	RH	RNF	WET	DTP	SOL	FLOW
Portable ozone monitoring systems													
Annual	Annual average	%	91.8	---	---	99.2	94.8	94.8	99.3	---	---	96.5	99.4
	# sites ≥ 75% valid	# sites (%)	12 (92)	0 (0)	0 (0)	13 (100)	12 (92)	12 (92)	13 (100)	0 (0)	0 (0)	12 (92)	4 (100)
	# sites < 75% valid	# sites (%)	1 (8)	0 (0)	0 (0)	0 (0)	1 (8)	1 (8)	0 (0)	0 (0)	0 (0)	1 (8)	0 (0)
1	Quarterly average	%	---	---	---	---	---	---	---	---	---	---	---
	# sites ≥ 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2	Quarterly average	%	95.7	---	---	99.7	95.7	95.7	99.8	---	---	99.7	98.9
	# sites ≥ 75% valid	# sites (%)	12 (100)	0 (0)	0 (0)	12 (100)	11 (92)	11 (92)	12 (100)	0 (0)	0 (0)	12 (100)	4 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	0 (0)	1 (8)	1 (8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
3	Quarterly average	%	88.9	---	---	98.9	94.1	94.1	98.9	---	---	94.1	99.7
	# sites ≥ 75% valid	# sites (%)	10 (77)	0 (0)	0 (0)	12 (92)	11 (85)	11 (85)	12 (92)	0 (0)	0 (0)	11 (85)	4 (100)
	# sites < 75% valid	# sites (%)	3 (23)	0 (0)	0 (0)	1 (8)	2 (15)	2 (15)	1 (8)	0 (0)	0 (0)	2 (15)	0 (0)
4	Quarterly average	%	---	---	---	---	---	---	---	---	---	---	---
	# sites ≥ 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)

[a] Network data collection statistics include: 1) the percent of valid hourly averages for each parameter across the network; 2) the number and percent of sites which achieved the minimum EPA requirement of 75% valid data capture, and 3) the number and percent of sites which failed to meet 75% valid data capture.

Parameter key: O_3 = ozone analyzer; SO_2 = sulfur dioxide analyzer; FLOW = filter pack flow rate; VWD = vector wind direction; SWS = scalar wind speed; TMP = ambient temperature; RH = relative humidity; RNF = precipitation; WET = wetness; DTP = delta temperature; SOL = solar radiation

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

Portable ozone monitoring systems typically operate during the summer ozone season only.

Precision and Accuracy

Ozone analyzers are automatically challenged daily with known zero and span concentrations. Most sites also undergo an automatic daily precision check. At a few sites, precision checks are performed weekly. All EPA reference method ozone sites operate both an analyzer (with ozone generator) and calibrator on site. The daily zero, span, and precision values are measured by both instruments, providing an independent reference to the on-site measurements. The NPS goal is for precision checks to fall within ± 10% of the calibration gas concentration.

Routine quality assurance multipoint calibrations of the GPMP ozone analyzers and calibrators are performed by the site operators monthly, and by the NPS-contracted network field specialists upon initial installation and every six months thereafter. Network field specialists perform their quality assurance checks using an ozone transfer standard (traceable to a National Institute of Standards and Technology (NIST)-certified primary standard). The NPS goal is for these accuracy checks to fall within ± 10% of the transfer standard gas concentrations. For more information on quality assurance within the network, please refer to the Quality Management Plan (QMP) and the Quality Assurance Project Plan (QAPP) which can be found on the Internet at: *http://www.nature.nps.gov/air/monitoring/network.cfm#procedures.*

Table 3 presents a summary of ozone analyzer precision results and semiannual accuracy results, by quarter, for 2008. Results are color-coded to indicate ideal performance (no shading), acceptable performance (yellow), and unacceptable performance (red). Accuracy results are presented only for NPS-operated sites, and typically include two entries for the year.

Table 4 presents a network summary of ozone analyzer precision and accuracy, by quarter, for 2008. Included in the table are the number of sites whose precision and accuracy checks fell within ± 5%, ± 10%, and outside of ± 10%.

Yellowstone National Park, Wyoming
Trout Lake
Photo by Jessica Ward/ Air Resource Specialists, Inc.

Table 3. 2008 Ozone analyzer precision and accuracy summary.

			Precision				Accuracy[g]		
National Park Unit	Site Name	Calendar Quarter	Required # of Precision Checks Met?[a]	Avg. Absolute Percent Difference[c, d]	Lower 95% Probability Limit[f]	Upper 95% Probability Limit[f]	Accuracy Check Performed During the Quarter?[b]	Avg. Absolute Percent Difference[c,d]	Maximum Percent Difference[e]
Sites operated by the National Park Service									
Big Bend	K-Bar Ranch Road	1	Y	0.7	-5.9	4.5	Y	1.3	2.2
		2	Y	2.8	-7.3	1.7	N	---	---
		3	Y	0.9	-6.2	4.4	Y	3.6	4.5
		4	Y	0.6	-2.2	0.9	N	---	---
Canyonlands	Island in the Sky	1	Y	1.8	-1.0	4.6	Y	0.3	-0.6
		2	Y	0.8	-3.6	2.0	N	---	---
		3	Y	1.3	-5.8	3.1	Y	5.6	-8.3
		4	Y	2.9	1.3	4.4	N	---	---
Chiricahua	Entrance Station	1	Y	2.0	0.7	3.2	N	---	---
		2	Y	2.7	1.4	4.0	Y	1.4	-4.4
		3	Y	2.8	0.9	4.6	N	---	---
		4	Y	1.1	-1.8	4.1	Y	3.1	-3.6
Craters of the Moon	Visitor Center	1	Y	2.7	-0.9	6.3	N	---	---
		2	N	3.0	-1.4	7.5	Y	4.2	4.5
		3	N	1.5	-3.2	6.3	Y	7.7	10.0
		4	Y	1.2	-4.5	6.8	N	---	---
Death Valley	Park Village	1	Y	0.2	-3.8	3.4	Y	0.8	2.0
		2	Y	1.5	-3.0	-0.1	Y	1.1	2.0
		3	Y	0.1	-1.0	1.2	N	---	---
		4	Y	0.5	-1.6	0.6	Y	0.3	-1.0
Denali	Headquarters	1	Y	0.6	-0.9	2.1	N	---	---
		2	Y	0.2	-3.5	3.1	Y	1.8	-2.7
		3	Y	2.9	-4.9	-0.9	N	---	---
		4	Y	1.1	-2.0	4.2	Y	0.6	-1.3
Glacier	West Glacier Horse Stables	1	Y	0.4	-3.3	2.5	N	---	---
		2	Y	0.2	-3.3	2.8	Y	2.2	-3.4
		3	Y	0.0	-2.0	2.0	N	---	---
		4	Y	1.1	-2.8	5.0	7	2.6	-3.3
Grand Canyon	The Abyss	1	Y	0.8	-1.0	2.5	N	---	---
		2	Y	1.9	-5.3	1.5	Y	5.3	10.0
		3	Y	6.8	-8.6	-5.0	N	---	---
		4	Y	7.2	-10.3	-4.1	Y	4.2	-4.9
Great Basin	Maintenance Yard	1	Y	0.7	-5.7	7.0	Y	2.3	3.4
		2	Y	3.4	0.2	6.6	Y	2.2	3.0
		3	Y	3.8	-0.3	7.8	N	---	---
		4	Y	2.7	-2.0	7.4	Y	1.5	-2.7
Great Smoky Mtns	Clingmans Dome	1	---	---	---	---	---	---	---
		2	N	1.3	-3.8	1.3	Y	0.6	-1.5
		3	N	1.9	-7.7	3.9	N	---	---
		4	Y	0.0	0.0	0.0	Y	5.7	8.4

Table 3. 2008 Ozone analyzer precision and accuracy summary (continued).

National Park Unit	Site Name	Calendar Quarter	Precision				Accuracy[g]		
			Required # of Precision Checks Met?[a]	Avg. Absolute Percent Difference[c, d]	Lower 95% Probability Limit[f]	Upper 95% Probability Limit[f]	Accuracy Check Performed During the Quarter?[b]	Avg. Absolute Percent Difference[c,d]	Maximum Percent Difference[e]
Sites operated by the National Park Service									
Great Smoky Mountains	Cove Mountain	1	Y	0.2	-1.2	0.8	N	---	---
		2	Y	0.2	-1.2	0.9	Y	1.1	4.3
		3	Y	0.0	-1.9	1.9	N	---	---
		4	Y	0.1	-1.3	1.1	Y	2.4	-2.8
Great Smoky Mountains	Look Rock	1	Y	0.6	-2.7	4.0	N	---	---
		2	Y	1.0	-1.0	2.9	Y	1.0	2.0
		3	Y	0.6	-2.1	3.3	N	---	---
		4	Y	0.3	-1.8	2.3	Y	0.8	-1.2
Joshua Tree	Black Rock	1	Y	0.6	-4.9	3.8	Y	4.0	6.2
		2	Y	6.0	-10.2	-1.8	N	---	---
		3	Y	7.8	-10.8	-4.9	N	---	---
		4	N	1.9	-8.2	4.4	Y	2.1	-2.9
Joshua Tree	Cottonwood Canyon	1	---	---	---	---	---	--	---
		2	N	6.4	0.4	12.4	Y	2.5	4.6
		3	Y	7.4	4.9	10.0	N	---	---
		4	Y	0.5	-10.9	9.9	Y	0.7	-1.0
Lassen Volcanic	Manzanita Lake Fire Station	1	Y	1.6	-1.1	4.3	Y	2.0	-4.3
		2	Y	1.1	-2.2	-0.1	N	---	---
		3	Y	0.7	-1.8	0.4	Y	1.0	-1.2
		4	Y	0.8	-4.0	2.3	N	---	---
Mammoth Cave	Houchin Meadow	1	Y	0.1	-1.2	1.0	N	---	---
		2	Y	0.0	-1.3	1.3	Y	1.2	-2.9
		3	Y	0.3	-1.8	1.1	Y	0.7	-1.4
		4	Y	0.1	-1.6	1.4	N	---	---
Mesa Verde	Resource Management Area	1	Y	0.9	-2.1	0.4	Y	0.1	0.4
		2	Y	1.2	-5.6	3.1	N	---	---
		3	Y	2.6	-3.2	8.3	Y	1.4	-2.0
		4	Y	3.3	0.7	5.8	N	---	---
Mount Rainier	Tahoma Woods	1	Y	0.2	-3.4	3.8	Y	0.5	0.8
		2	Y	0.5	-4.0	5.0	N	---	---
		3	Y	0.2	-6.0	5.6	Y	0.3	0.6
		4	Y	1.4	-5.2	2.3	Y	1.9	-3.0
Petrified Forest	South Entrance	1	Y	1.3	-5.4	2.8	N	---	---
		2	Y	1.2	-2.5	0.1	Y	1.4	-3.0
		3	Y	3.3	-9.6	3.1	N	---	---
		4	Y	1.3	-2.4	-0.2	Y	0.5	1.2
Pinnacles	SW of East Entrance Stn	1	Y	0.1	-3.0	3.2	Y	0.8	-1.7
		2	Y	1.5	0.3	2.6	N	---	---
		3	Y	0.7	-1.1	2.5	Y	2.4	-3.0
		4	Y	1.2	0.1	2.3	N	---	---

Table 3. 2008 Ozone analyzer precision and accuracy summary (continued).

			Precision				Accuracy[g]		
National Park Unit	Site Name	Calendar Quarter	Required # of Precision Checks Met?[a]	Avg. Absolute Percent Difference[c, d]	Lower 95% Probability Limit[f]	Upper 95% Probability Limit[f]	Accuracy Check Performed During the Quarter?[b]	Avg. Absolute Percent Difference[c,d]	Maximum Percent Difference[e]
Sites operated by the National Park Service									
Rocky Mountain	Long's Peak	1	Y	0.2	-1.5	1.9	Y	2.8	-3.3
		2	Y	0.5	-4.8	3.9	N	---	---
		3	Y	3.4	-4.6	-2.2	Y	0.4	-2.0
		4	Y	3.9	-5.2	-2.6	N	---	---
Sequoia and Kings Canyon	Ash Mountain	1	Y	0.8	-6.2	4.6	Y	5.7	9.6
		2	Y	0.2	-0.9	1.3	N	---	---
		3	Y	0.3	-3.1	2.4	Y	1.8	-2.8
		4	Y	0.2	-1.1	1.5	N	---	---
Sequoia and Kings Canyon	Lower Kaweah	1	Y	0.0	-1.2	1.2	Y	2.3	5.7
		2	Y	0.6	-1.7	0.4	N	---	---
		3	Y	0.3	-1.8	1.3	Y	1.7	-2.4
		4	Y	0.2	-1.2	0.7	N	---	---
Shenandoah	Big Meadows	1	Y	2.3	0.5	4.1	N	---	---
		2	Y	2.5	0.5	4.5	Y	0.7	-1.0
		3	Y	3.0	0.1	5.8	Y	1.5	4.9
		4	Y	1.8	-0.2	3.9	N	---	---
Voyageurs	Sullivan Bay	1	Y	1.3	-4.1	1.6	N	---	---
		2	Y	6.3	-10.5	-2.1	Y	9.7	-10.5
		3	Y	3.2	1.9	4.5	N	---	---
		4	Y	2.5	1.1	3.9	Y	1.1	1.2
Yellowstone	Water Tank	1	Y	1.0	-2.4	0.5	N	---	---
		2	Y	2.2	-5.4	0.9	Y	0.5	1.3
		3	Y	1.0	-3.3	1.4	Y	1.5	-2.7
		4	Y	0.6	-1.9	0.6	N	---	---
Yosemite	Turtleback Dome	1	Y	0.4	-4.5	3.7	N	---	---
		2	Y	2.5	-3.9	8.9	Y	3.4	-4.6
		3	Y	4.6	3.5	5.7	N	---	---
		4	Y	1.8	-0.4	4.1	Y	3.0	6.7
Zion	Dalton's Wash	1	Y	2.7	-4.2	-1.2	Y	1.1	1.5
		2	Y	4.4	-6.2	-2.6	N	---	---
		3	Y	5.0	-6.7	-3.3	Y	4.3	-4.6
		4	Y	3.1	-7.5	1.4	N	---	---

Table 3. 2008 Ozone analyzer precision and accuracy summary (continued).

National Park Unit	Site Name	Calendar Quarter	Precision			
			Required # of Precision Checks Met?[a]	Avg. Absolute Percent Difference[c, d]	Lower 95% Probability Limit[f]	Upper 95% Probability Limit[f]
Sites operated by cooperating state agencies						
Acadia	Cadillac Mountain	1	---	---	---	---
		2	Y	0.5	-1.0	2.0
		3	Y	0.5	-1.4	2.3
		4	---	---	---	---
Acadia	McFarland Hill	1	N	0.6	-2.0	0.8
		2	Y	0.2	-1.2	0.7
		3	N	0.8	-2.8	1.1
		4	N	0.1	-2.8	2.7
Badlands	Visitor Center	1	Y	2.8	-4.7	-1.0
		2	Y	2.7	-4.1	-1.2
		3	Y	2.6	-5.9	0.6
		4	Y	0.2	-3.0	2.6
Cape Cod	Cape Cod	1	---	---	---	---
		2	Y	3.5	2.4	4.6
		3	Y	2.3	0.1	4.5
		4	---	---	---	---
Chamizal	Chamizal	1	Y	0.7	-2.0	0.6
		2	Y	1.2	-2.3	-0.1
		3	Y	0.5	-2.7	1.7
		4	Y	0.1	-7.5	7.2
Congaree	Congaree Bluff	1	N	3.1	-2.7	8.8
		2	N	3.3	-2.2	8.8
		3	N	0.3	-6.2	6.8
		4	Y	2.4	-3.9	8.6
Cowpens	State Monitor	1	N	5.9	-1.1	12.9
		2	Y	1.4	-2.4	5.3
		3	Y	3.4	-6.1	12.8
		4	N	1.6	-10.1	7.0
Everglades	Cutler Road	1	Y	0.3	-2.3	1.7
		2	Y	1.0	-3.7	1.6
		3	Y	2.2	-3.8	-0.5
		4	Y	0.0	-2.1	2.1
Great Smoky Mountains	Cades Cove	1	Y	1.8	-0.8	4.3
		2	Y	2.0	-2.0	6.1
		3	Y	3.8	-0.9	8.4
		4	---	---	---	---
Great Smoky Mountains	Purchase Knob	1	---	---	---	---
		2	Y	1.3	-0.1	2.6
		3	Y	0.2	-1.3	1.7
		4	Y	0.3	-0.8	1.4

Table 3. 2008 Ozone analyzer precision and accuracy summary (continued).

National Park Unit	Site Name	Calendar Quarter	Precision			
			Required # of Precision Checks Met?[a]	Avg. Absolute Percent Difference[c, d]	Lower 95% Probability Limit[f]	Upper 95% Probability Limit[f]
Sites operated by cooperating state agencies						
indiana Dunes	Ammunition Bunker	1	---	---	---	---
		2	Y	2.1	-0.4	4.7
		3	Y	1.0	-0.7	2.7
		4	---	---	---	---
Mount Rainier	Jackson Visitor's Center	1	---	---	---	---
		2	Y	0.4	-5.7	4.9
		3	N	3.8	0.9	6.6
		4	Y	0.3	-4.8	4.2
Saguaro	Pima County	1	Y	0.3	-2.2	2.8
		2	Y	0.4	-4.2	5.0
		3	Y	0.0	-1.1	1.1
		4	Y	1.0	-0.2	2.2
Theodore Roosevelt	Painted Canyon Visitor Ctr	1	Y	1.7	-4.0	0.6
		2	Y	0.3	-6.0	5.4
		3	Y	0.9	-4.1	6.0
		4	Y	1.9	-4.6	0.8
Wind Cave	Visitor Center	1	Y	0.6	-0.6	1.7
		2	Y	1.3	0.5	2.1
		3	Y	0.2	-1.9	2.4
		4	Y	0.0	-1.8	1.8

[a] Precision checks are required by the Environmental Protection Agency (EPA) of all pollutant analyzers collecting data which are to be submitted to the EPA Air Quality System (AQS). A precision check is performed by challenging the pollutant analyzer with a known concentration of gas 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. According to the NPS standard operating procedures, the pollutant analyzer must respond within 10% of the transfer standard.

[b] Accuracy checks are required by the EPA of all pollutant analyzers collecting data which are to be submitted to the EPA AQS. An accuracy check is performed by challenging the pollutant analyzer with a known concentration of gas from the pollutant transfer standard at several different points. The percent difference between the analyzer and the transfer standard is then calculated. According to NPS standard operating procedures, the pollutant analyzer must respond within 10% of the transfer standard. All accuracy checks reported here were performed by the reporting organization and onto by an outside auditor.

[c] Percent Difference = [(analyzer - transfer standard) / transfer standard] x 100

[d] Average Absolute Percent Difference is the mean of the absolute value of all individual precision check percent differences during the quarter, or the mean of the absolute value of all the percent differences from each point challenged during an accuracy check.

[e] Maximum Percent Difference is the highest percent difference from the points of a multipoint (or accuracy) calibration. A positive value indicates the analyzer read high, a negative value indicates the analyzer read low.

[f] Upper/Lower 95% Probability Limits = (Average Percent Difference) ± (1.96) (Standard Deviation of precision check percent differences in the quarter). The probability limits represent the interval having a 95% chance of containing the true average percent difference. Probability limits must be within ± 15%.

[g] Accuracy results are presented for NPS-operated sites only.

Operating agency key: plain text = site operated by the National Park 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: or Ideal: indicates percent difference within ± 5% or a probability limit within ± 10%.

Acceptable: indicates a percent difference between ± 5.1-10% or a probability limit between ± 10.1-15%.

Unacceptable: indicates a percent difference greater than ± 10% or a probability limit greater than ± 15%.

Table 4. 2008 Ozone analyzer precision and accuracy overall network summary.

		Precision[a] Average Absolute Percent Difference			Accuracy[b,c] Average Absolute Percent Difference		
Calendar Quarter	# Operational Sites	# Sites within ± 5%	# Sites within ± 5.1-10%	# Sites > ± 10%	# Sites within ± 5%	# Sites within ± 5.1-10%	# Sites > ± 10%
Sites operated by the National Park Service							
1	26	26	0	0	11	1	0
2	28	25	3	0	13	2	0
3	28	25	3	0	12	2	0
4	28	27	1	0	16	0	0
Sites operated by cooperating state agencies							
1	10	9	1	0			
2	15	15	0	0			
3	15	15	0	0			
4	11	11	0	0			

[a] Precision checks are required by the Environmental Protection Agency (EPA) of all pollutant analyzers collecting data which are to be submitted to the EPA Air Quality System (AQS). A precision check is performed by challenging the pollutant analyzer with a known concentration of gas 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. According to NPS standard operating procedures, the pollutant analyzer must respond within 10% of the transfer standard.

[b] Accuracy checks are required by the EPA of all pollutant analyzers collecting data which are to be submitted to the EPA AQS. An accuracy check is performed by challenging the pollutant analyzer with a known concentration of gas from the pollutant transfer standard of several different points. The percent difference between the analyzer and the transfer standard is then calculated. According to NPS standard operating procedures, the pollutant analyzer must respond within 10% of the transfer standard.

[c] Accuracy results are presented for NPS-operated sites only.