



2009 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) 2009 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.

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 97.5%, for sulfur dioxide the average was 99.7%, and for PM_{2.5} the average was 86.5%.

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 2009, 28 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.

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 $\pm 10\%$ 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 $\pm 10\%$ 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 2009. 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 2009. Included in the table are the number of sites whose precision and accuracy checks fell within $\pm 5\%$, $\pm 10\%$, and outside of $\pm 10\%$.

2009 GPMP Data Quality Assurance

Table 1. 2009 Data collection statistics.

National Park Unit	Site Name	Parameter Code												
		O ₃ % valid ^a	SO ₂ % valid ^a	PM _{2.5} % valid ^a	PM ₁₀ % valid ^a	WD % valid ^a	WS % 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	98.5	---	---	---	96.7	96.7	98.8	98.8	98.6	98.5	98.8	98.9	99.1
Canyonlands	Island in the Sky	93.0	---	---	---	99.5	99.5	99.4	100.0	99.5	99.0	97.0	98.6	99.9
Chiricahua	Entrance Station	99.1	---	---	---	99.9	99.9	99.9	99.1	99.6	99.1	99.9	99.9	99.9
Craters of the Moon	Visitor Center	99.5	---	---	---	97.4	97.4	99.8	99.8	---	---	---	89.1	---
Death Valley	Park Village	96.3	---	---	---	88.4	88.4	98.7	99.5	98.3	---	---	98.9	---
Denali	Headquarters	98.9	---	---	---	99.9	99.9	99.9	99.4	99.7	99.5	99.9	99.9	100.0
Everglades	Beard Center	---	---	---	---	93.3	93.3	87.3	93.9	92.8	93.2	78.7	97.4	93.4
Glacier	W. Glacier Horse Stables	98.5	---	---	---	98.5	98.5	99.7	99.8	99.3	72.1	99.7	99.5	99.7
Grand Canyon	The Abyss	96.7	---	---	---	95.4	99.8	60.5	99.8	99.5	97.1	36.6	99.9	97.8
Great Basin	Maintenance Yard	93.4	---	---	---	97.4	97.4	59.4	97.7	97.5	97.4	59.4	97.8	98.3
Great Smoky Mtns	Clingmans Dome	98.3	---	---	---	98.5	98.5	99.9	99.9	99.5	---	---	99.9	---
Great Smoky Mtns	Cove Mountain	99.8	99.9	---	---	96.4	96.1	98.9	98.9	87.4	---	---	---	---
Great Smoky Mtns	Look Rock	99.5	---	99.0	---	99.6	99.6	99.5	99.6	99.3	97.7	99.5	99.6	99.7
Hawaii Volcanoes	Observatory	---	100.0	79.3	---	99.6	100.0	100.0	100.0	99.1	---	---	---	---
Hawaii Volcanoes	Visitor Center	---	100.0	---	---	99.9	99.9	100.0	99.7	98.8	---	---	100.0	---
Joshua Tree	Black Rock	95.3	---	---	---	98.1	98.0	98.0	98.0	97.8	97.4	97.8	97.2	98.0
Joshua Tree	Cottonwood Canyon	92.1	---	---	61.0	99.3	99.3	99.3	99.3	99.3	---	---	99.3	---
Lassen Volcanic	Manzanita Lake Fire Stn	98.8	---	---	---	98.4	98.4	99.5	99.6	99.2	93.5	99.5	99.7	99.7
Mammoth Cave	Houchin Meadow	95.9	98.4	---	---	97.8	98.0	98.0	99.0	98.8	98.2	98.0	99.0	98.7
Mesa Verde	Resource Mgmt Area	99.5	---	---	---	100.0	100.0	99.7	100.0	99.6	99.7	99.6	100.0	99.9
Mount Rainier	Tahoma Woods	95.8	---	---	---	79.2	82.8	99.4	99.6	99.6	98.2	99.4	94.9	99.7
Petrified Forest	South Entrance	99.1	---	---	---	90.9	92.2	99.2	99.3	61.2	98.9	99.2	99.4	99.4
Pinnacles	SW of East Entrance Stn	97.4	---	---	---	95.8	99.7	99.7	79.3	99.5	99.0	99.7	99.8	99.7
Rocky Mountain	Long's Peak	96.9	---	---	---	99.7	99.7	97.1	97.1	99.5	93.5	97.1	99.9	99.9
Sequoia/KCanyon	Ash Mountain	98.0	---	86.3	---	98.7	98.7	99.6	99.6	69.1	98.8	97.7	99.6	99.8
Sequoia/KCanyon	Lower Kaweah	99.3	---	---	---	99.3	99.7	99.7	99.9	99.4	---	---	99.7	---
Shenandoah	Big Meadows	99.4	---	98.8	---	99.4	99.4	99.6	97.8	99.4	93.6	89.6	99.6	99.8
Voyageurs	Sullivan Bay	98.2	---	---	---	99.7	99.7	99.7	99.8	99.7	99.6	97.2	99.8	99.7
Yellowstone	Old Faithful	---	---	61.5	---	96.4	96.4	100.0	100.0	---	---	---	---	---
Yellowstone	Water Tank	99.3	---	---	---	65.1	65.1	99.0	99.0	81.9	95.2	98.6	99.1	99.7
Yosemite	Turtleback Dome	98.2	---	---	---	93.3	94.3	99.4	96.8	99.1	97.0	92.7	99.7	99.6
Zion	Dalton's Wash	94.2	---	91.1	---	97.0	97.0	97.4	97.4	51.7	---	---	96.8	---
Average Network Data Collection		97.5	99.7	86.5	61.0	95.9	96.3	96.4	98.3	94.0	96.2	92.4	98.7	99.2
Sites operated by cooperating state agencies														
Acadia	Cadillac Mountain	99.3	---	---	---	96.8	99.2	98.5	100.0	---	---	---	---	---
Acadia	McFarland Hill	99.5	---	97.9	---	98.2	98.2	98.8	99.9	99.9	100.0	99.6	98.7	99.8
Badlands	Visitor Center	99.9	99.9	94.6	99.8	---	---	---	---	---	---	---	---	---
Cape Cod	Cape Cod	97.2	---	---	---	71.3	71.3	100.0	100.0	---	---	---	100.0	---
Chamizal	Chamizal	99.2	---	---	---	99.9	99.9	99.9	99.9	---	---	---	100.0	---
Congaree	Congaree Bluff	99.4	99.5	---	---	---	---	---	---	---	---	---	---	---
Cowpens	State Monitor	97.9	---	---	---	---	---	---	---	---	---	---	---	---
Everglades	Cutler Road	99.2	---	---	---	---	---	---	---	---	---	---	---	---
Great Smoky Mtns	Cades Cove	99.3	---	---	---	99.2	99.2	99.7	99.3	99.5	---	---	99.7	---

Table 1. 2009 Data collection statistics (continued).

National Park Unit	Site Name	Parameter Code												
		O ₃ % valid ^a	SO ₂ % valid ^a	PM _{2.5} % valid ^a	PM ₁₀ % valid ^a	WD % valid ^a	WS % 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														
<i>Great Smoky Mountains</i>	Purchase Knob	95.1	---	---	---	---	---	---	---	---	---	---	---	---
<i>Indiana Dunes</i>	Ammunition Bunker	98.5	98.7	99.1	---	98.0	98.1	99.4	99.4	---	---	---	98.6	---
<i>Mount Rainier</i>	Jackson Visitor's Center	89.5	---	---	---	---	---	---	---	---	---	---	---	---
<i>Saguaro</i>	Pima County	99.8	---	---	---	99.7	100.0	100.0	100.0	---	---	---	99.5	---
<i>Theodore Roosevelt</i>	Painted Canyon Visitor Ctr	99.3	97.7	98.1	---	98.9	98.9	99.3	93.6	99.2	99.2	95.9	99.3	99.9
<i>Wind Cave</i>	Visitor Center	67.4	74.5	94.1	99.5	99.4	99.4	99.9	99.9	95.7	99.3	99.9	99.9	100.0
<i>Yellowstone</i>	West Yellowstone State	---	---	96.3	---	99.9	99.9	99.9	---	---	---	---	---	---
<i>Yosemite</i>	Village	---	---	90.1	---	---	---	---	---	---	---	---	---	---
Average Network Data Collection		95.7	94.0	95.8	99.6	96.4	96.3	99.6	99.0	98.6	99.5	98.4	99.5	99.9
Portable ozone monitoring systems														
<u>Agate Fossil Beds</u>	Residence Area	70.8	---	---	---	99.5	99.5	99.7	99.7	99.7	---	---	99.7	---
<u>Assateague Island</u>	Maintenance Area	99.8	---	---	---	99.9	99.9	99.9	99.9	99.9	---	---	99.9	---
<u>Carlsbad Caverns</u>	Maintenance Area	61.2	---	---	---	99.9	99.9	99.4	99.4	99.9	---	---	99.4	99.9
<u>Colorado</u>	Maintenance Yard	99.9	---	---	---	100.0	100.0	100.0	100.0	100.0	---	---	100.0	---
<u>Cumberland Gap</u>	Hensley Settlement	99.3	---	---	---	99.9	99.9	99.9	99.9	99.9	---	---	99.9	---
<u>Devil's Tower</u>	Joyner Ridge Trail	94.9	---	---	---	99.2	98.9	99.5	99.5	99.5	---	---	99.5	99.9
<u>Dinosaur</u>	West Entrance Housing	99.1	---	---	---	99.8	99.8	99.8	99.8	99.8	---	---	99.8	99.9
<u>Fort Donelson</u>	Visitor Center	90.6	---	---	---	91.8	91.8	91.8	91.8	---	---	---	---	---
<u>Glacier</u>	St. Mary's Ranger District	93.0	---	---	---	99.7	99.6	99.8	99.8	99.8	---	---	99.8	---
<u>Joshua Tree</u>	Pinto Wells	58.9	---	---	---	95.6	95.6	99.9	99.9	99.9	---	---	99.9	75.3
<u>Mojave</u>	Kelso Mountains	99.8	---	---	---	99.9	99.9	99.9	99.9	99.9	---	---	99.9	---
<u>Natchez Trace Parkway</u>	Buzzard Roost Springs	94.0	---	---	---	100.0	100.0	100.0	100.0	100.0	---	---	84.7	---
<u>Olympic</u>	Deer Park	0.0	---	---	---	100.0	100.0	100.0	100.0	100.0	---	---	100.0	---
<u>Shiloh</u>	Russian Tenant Field	82.2	---	---	---	45.4	45.6	45.6	45.6	---	---	---	---	---
<u>Yosemite</u>	School Yard	99.3	---	---	---	99.7	99.6	99.9	99.9	99.9	---	---	99.9	---
Average Network Data Collection		84.6	---	---	---	97.4	97.3	97.7	97.7	99.9	---	---	98.7	93.5

^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 O₃ and SO₂, calibration events were removed from the number possible.

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: O₃ = ozone analyzer SO₂ = sulfur dioxide analyzer PM_{2.5} = particulate sampler ≤ 2.5 microns
 PM₁₀ = particulate sampler ≤ 10 microns WD = wind direction TMP = ambient temperature
 RNF = precipitation DTP = delta temperature WS = wind speed
 RH = relative humidity WET = wetness SOL = solar radiation
 FLOW = filter pack flow rate

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. 2009 Network summary of data collection statistics.

Calendar Quarter	Network Data Collection Statistic ^a	Units	Parameter Code										
			O ₃	SO ₂	WD	WS	TMP	RH	RNF	WET	DTP	SOL	FLOW
Sites operated by the National Park Service													
Annual	Annual average	%	97.5	99.7	95.9	96.3	96.4	98.3	94.0	96.2	92.4	98.7	99.2
	# sites ≥ 75% valid	# sites (%)	28 (100)	3 (100)	31 (97)	31 (97)	30 (94)	32 (100)	27 (90)	21 (96)	19 (86)	29 (100)	22 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	1 (3)	1 (3)	2 (6)	0 (0)	3 (10)	1 (5)	3 (14)	0 (0)	0 (0)
1	Quarterly average	%	96.3	96.6	94.5	94.6	96.5	96.1	89.6	95.2	94.4	97.4	99.6
	# sites ≥ 75% valid	# sites (%)	27 (100)	3 (100)	30 (97)	30 (97)	30 (97)	30 (97)	26 (90)	21 (96)	21 (96)	27 (96)	22 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	1 (3)	1 (3)	1 (3)	1 (3)	3 (10)	1 (5)	1 (5)	1 (4)	0 (0)
2	Quarterly average	%	98.5	96.1	96.5	96.6	96.0	99.2	90.8	94.4	91.9	99.2	98.9
	# sites ≥ 75% valid	# sites (%)	28 (100)	3 (100)	30 (94)	30 (94)	30 (94)	32 (100)	27 (90)	21 (96)	20 (91)	29 (100)	22 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	2 (6)	2 (6)	2 (6)	0 (0)	3 (10)	1 (5)	2 (9)	0 (0)	0 (0)
3	Quarterly average	%	98.5	95.7	98.2	98.0	96.1	98.9	97.8	97.9	89.8	99.2	98.5
	# sites ≥ 75% valid	# sites (%)	28 (100)	3 (100)	32 (100)	32 (100)	30 (94)	32 (100)	29 (97)	22 (100)	19 (86)	29 (100)	22 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	0 (0)	2 (6)	0 (0)	1 (3)	0 (0)	3 (14)	0 (0)	0 (0)
4	Quarterly average	%	97.5	97.6	95.8	96.0	99.0	99.2	97.6	97.4	87.6	99.3	99.7
	# sites ≥ 75% valid	# sites (%)	28 (100)	3 (100)	30 (94)	30 (94)	32 (100)	32 (100)	29 (97)	22 (100)	20 (91)	29 (100)	22 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	2 (6)	2 (6)	0 (0)	0 (0)	1 (3)	0 (0)	2 (9)	0 (0)	0 (0)
Sites operated by cooperating state agencies													
Annual	Annual average	%	95.7	94.0	96.4	96.3	99.6	99.0	98.6	99.5	98.4	99.5	99.9
	# sites ≥ 75% valid	# sites (%)	14 (93)	4 (80)	9 (90)	9 (90)	10 (100)	9 (100)	4 (100)	3 (100)	3 (100)	8 (100)	3 (100)
	# sites < 75% valid	# sites (%)	1 (7)	1 (20)	1 (10)	1 (10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
1	Quarterly average	%	98.9	99.8	89.4	88.2	99.8	99.9	99.7	99.6	99.5	99.7	99.9
	# sites ≥ 75% valid	# sites (%)	12 (100)	5 (100)	8 (89)	8 (89)	9 (100)	8 (100)	4 (100)	3 (100)	3 (100)	8 (100)	3 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	1 (11)	1 (11)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2	Quarterly average	%	98.3	99.3	97.1	97.7	99.5	97.0	95.5	99.5	99.7	99.4	99.9
	# sites ≥ 75% valid	# sites (%)	15 (100)	5 (100)	10 (100)	10 (100)	10 (100)	9 (100)	4 (100)	3 (100)	3 (100)	8 (100)	3 (100)
	# 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)
3	Quarterly average	%	95.3	97.5	99.1	99.3	99.3	99.6	99.6	99.2	97.1	99.0	99.0
	# sites ≥ 75% valid	# sites (%)	14 (93)	5 (100)	10 (100)	10 (100)	10 (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)
4	Quarterly average	%	89.5	79.7	99.2	99.2	99.8	99.8	99.5	99.7	97.0	99.8	99.9
	# sites ≥ 75% valid	# sites (%)	11 (92)	4 (80)	9 (100)	9 (100)	9 (100)	8 (100)	4 (100)	3 (100)	3 (100)	8 (100)	3 (100)
	# sites < 75% valid	# sites (%)	1 (8)	1 (20)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 2. 2009 Network summary of data collection statistics (continued).

Calendar Quarter	Network Data Collection Statistic ^a	Units	Parameter Code										
			O ₃	SO ₂	WD	WS	TMP	RH	RNF	WET	DTP	SOL	FLOW
Portable ozone monitoring systems													
Annual	Annual average	%	84.6	---	97.4	97.3	97.7	97.7	99.9	---	---	98.7	93.5
	# sites ≥ 75% valid	# sites (%)	11 (73)	0 (0)	14 (93)	14 (93)	14 (93)	14 (93)	13 (100)	0 (0)	0 (0)	13 (100)	4 (100)
	# sites < 75% valid	# sites (%)	4 (27)	0 (0)	1 (7)	1 (7)	1 (7)	1 (7)	0 (0)	0 (0)	0 (0)	0 (0)	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	%	87.6	---	99.2	99.2	99.4	99.4	99.7	---	---	99.3	82.2
	# sites ≥ 75% valid	# sites (%)	11 (79)	0 (0)	14 (100)	14 (100)	14 (100)	14 (100)	13 (100)	0 (0)	0 (0)	13 (100)	3 (75)
	# sites < 75% valid	# sites (%)	3 (21)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (25)
3	Quarterly average	%	82.4	---	96.1	96.1	96.6	96.6	100.0	---	---	98.3	99.9
	# sites ≥ 75% valid	# sites (%)	12 (80)	0 (0)	14 (93)	14 (93)	14 (93)	14 (93)	13 (100)	0 (0)	0 (0)	13 (100)	4 (100)
	# sites < 75% valid	# sites (%)	3 (20)	0 (0)	1 (7)	1 (7)	1 (7)	1 (7)	0 (0)	0 (0)	0 (0)	0 (0)	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)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

^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: O₃ = ozone analyzer WD = wind direction TMP = ambient temperature RNF = precipitation DTP = delta temperature
 SO₂ = sulfur dioxide analyzer WS = wind speed RH = relative humidity WET = wetness SOL = solar radiation
 FLOW = filter pack flow rate

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

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

Table 3. 2009 Ozone analyzer precision and accuracy summary.

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									
Big Bend	K-Bar Ranch Road	1	Y	3.0	-7.7	1.7	y	3.6	5.0
		2	Y	7.6	-10.5	-4.7	N	---	---
		3	Y	2.2	-5.1	0.8	Y	2.6	-4.9
		4	Y	0.6	-4.6	5.8	Y	1.5	2.0
Canyonlands	Island in the Sky	1	Y	1.8	-1.5	5.1	Y	2.9	3.1
		2	Y	1.3	-3.8	1.2	N	---	---
		3	Y	2.7	-5.0	-0.5	Y	4.3	-6.2
		4	Y	0.4	-6.0	5.3	N	---	---
Chiricahua	Entrance Station	1	Y	0.2	-1.2	0.9	N	---	---
		2	Y	0.9	-2.2	0.3	Y	1.1	-2.3
		3	Y	2.3	-5.3	0.7	N	---	---
		4	Y	1.0	-2.5	0.4	Y	1.3	-1.7
Craters of the Moon	Visitor Center	1	Y	0.8	-7.1	5.5	N	---	---
		2	Y	0.4	-3.7	4.5	Y	2.1	-2.8
		3	Y	0.0	-3.8	3.8	Y	3.5	-4.6
		4	Y	0.8	-6.0	4.4	N	---	---
Death Valley	Park Village	1	Y	0.6	-3.3	2.0	N	---	---
		2	Y	2.1	-1.2	5.4	Y	4.1	-6.5
		3	Y	0.7	-3.3	4.8	N	---	---
		4	Y	0.9	-3.1	1.3	N	---	---
Denali	Headquarters	1	Y	2.4	1.2	3.7	N	---	---
		2	Y	0.7	-2.3	3.8	Y	1.4	-2.8
		3	Y	1.1	-1.8	-0.3	N	---	---
		4	Y	1.6	-1.1	4.4	Y	0.7	-1.3
Glacier	West Glacier Horse Stables	1	Y	0.8	-2.5	4.1	N	---	---
		2	Y	2.1	-2.9	7.1	Y	2.1	-3.0
		3	Y	1.7	-5.2	1.8	N	---	---
		4	Y	2.4	-4.3	-0.4	Y	1.1	1.7
Grand Canyon	The Abyss	1	Y	8.4	-9.8	-7.1	N	---	---
		2	Y	4.4	-11.8	2.9	Y	3.7	-5.0
		3	Y	2.6	-5.1	-0.2	N	---	---
		4	Y	4.3	-7.7	-0.9	Y	1.6	-2.0
Great Basin	Maintenance Yard	1	Y	3.1	1.7	4.6	N	---	---
		2	Y	2.5	-1.1	6.0	Y	5.4	6.7
		3	Y	1.3	-1.0	3.6	N	---	---
		4	Y	1.6	-2.0	5.1	N	---	---
Great Smoky Mtns	Clingmans Dome	1	---	---	---	---	---	---	---
		2	N	0.3	-3.6	2.9	Y	0.7	1.4
		3	N	2.1	-3.8	7.9	N	---	---
		4	Y	1.9	-1.8	5.7	Y	4.4	4.9

Table 3. 2009 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	0.1	-1.1	1.3	N	---	---
		2	Y	0.2	-1.3	0.9	Y	1.3	1.7
		3	Y	0.5	-0.8	1.8	N	---	---
		4	Y	0.3	-1.4	0.8	Y	3.5	5.0
Great Smoky Mountains	Look Rock	1	Y	0.5	-2.6	3.6	N	---	---
		2	Y	0.1	-1.6	1.8	Y	0.7	-1.4
		3	Y	0.9	-1.3	3.1	N	---	---
		4	Y	0.0	-2.1	2.2	Y	2.1	3.3
Joshua Tree	Black Rock	1	Y	0.4	-1.6	2.5	Y	1.7	-5.0
		2	Y	1.0	-0.2	2.1	Y	0.4	-1.0
		3	Y	1.1	-0.4	2.6	N	---	---
		4	Y	0.8	-3.3	1.8	Y	0.3	1.3
Joshua Tree	Cottonwood Canyon	1	Y	6.8	-10.3	-3.2	N	--	---
		2	Y	4.7	-10.8	1.3	Y	1.7	5.0
		3	N	0.6	-8.4	7.1	N	---	---
		4	N	0.3	-3.2	2.5	Y	0.7	1.5
Lassen Volcanic	Manzanita Lake Fire Station	1	Y	1.1	-2.7	0.5	Y	4.1	5.7
		2	Y	1.8	-3.0	-0.6	Y	---	---
		3	Y	2.0	-5.3	1.4	Y	0.2	0.8
		4	Y	1.2	-3.5	1.1	N	---	---
Mammoth Cave	Houchin Meadow	1	Y	1.8	-1.5	5.0	N	---	---
		2	Y	1.9	-2.8	6.6	Y	0.1	-0.3
		3	Y	1.0	-2.8	0.8	N	---	---
		4	Y	1.0	-2.0	0.1	Y	0.4	1.0
Mesa Verde	Resource Management Area	1	Y	4.3	-2.3	10.8	Y	3.9	-4.2
		2	Y	5.7	3.3	8.0	N	---	---
		3	Y	4.2	-0.9	9.3	Y	2.5	-4.9
		4	Y	3.4	-1.3	8.1	N	---	---
Mount Rainier	Tahoma Woods	1	Y	2.5	-6.3	1.3	N	---	---
		2	Y	0.5	-1.5	2.4	Y	1.7	2.0
		3	Y	0.5	-2.3	3.3	N	---	---
		4	Y	1.0	-1.3	3.2	Y	0.4	-1.0
Petrified Forest	South Entrance	1	Y	1.7	-3.7	0.3	N	---	---
		2	Y	1.3	-2.9	0.3	Y	2.7	-3.0
		3	Y	2.3	-5.5	1.0	N	---	---
		4	Y	1.9	-3.8	0.0	Y	1.0	-3.3
Pinnacles	SW of East Entrance Stn	1	Y	0.3	-1.7	2.3	N	---	---
		2	Y	1.0	-2.1	0.1	Y	5.8	6.7
		3	Y	0.9	-2.0	0.2	Y	1.0	1.7
		4	Y	0.7	-1.9	0.4	N	---	---

Table 3. 2009 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									
Rocky Mountain	Long's Peak	1	Y	3.8	-5.0	-2.7	N	---	---
		2	Y	1.8	-4.2	0.5	Y	2.9	-3.3
		3	Y	0.7	-3.6	2.2	Y	2.1	3.0
		4	Y	1.5	-5.6	2.6	N	---	---
Sequoia and Kings Canyon	Ash Mountain	1	Y	0.3	-0.9	1.5	N	---	---
		2	Y	0.3	-1.6	1.1	Y	6.5	-7.4
		3	Y	0.0	-1.1	1.1	Y	0.8	-1.2
		4	Y	0.0	-1.3	1.2	N	---	---
Sequoia and Kings Canyon	Lower Kaweah	1	Y	0.7	-2.3	0.9	N	---	---
		2	Y	1.0	-1.9	-0.2	N	2.7	-4.4
		3	Y	1.0	-2.1	0.0	Y	3.0	3.3
		4	Y	1.1	-2.0	-0.2	N	---	---
Shenandoah	Big Meadows	1	Y	1.7	-0.9	4.3	N	---	---
		2	Y	1.3	-0.5	3.2	Y	11.9	25.4
		3	Y	0.0	-2.2	2.2	N	---	---
		4	Y	1.4	-5.8	2.9	Y	4.1	-5.0
Voyageurs	Sullivan Bay	1	Y	2.4	1.1	3.6	N	---	---
		2	Y	2.2	1.2	3.2	N	---	---
		3	Y	2.5	1.4	3.7	Y	2.5	3.3
		4	Y	2.7	1.6	3.7	Y	0.9	1.5
Yellowstone	Water Tank	1	Y	1.3	-2.5	0.0	N	---	---
		2	Y	1.2	-3.4	1.0	Y	0.6	-1.7
		3	Y	1.1	-3.3	1.1	Y	9.4	-10.0
		4	Y	1.7	0.1	3.2	N	---	---
Yosemite	Turtleback Dome	1	Y	0.7	-0.3	1.6	N	---	---
		2	Y	0.2	-1.9	2.4	Y	0.7	1.5
		3	Y	0.7	-0.2	1.6	N	---	---
		4	Y	0.5	-0.4	1.4	Y	1.7	3.3
Zion	Dalton's Wash	1	Y	3.1	-7.5	1.4	Y	0.8	-1.3
		2	Y	1.5	-5.6	2.6	N	---	---
		3	Y	3.3	-6.3	-0.2	Y	7.7	8.3
		4	Y	1.1	-2.4	0.3	N	---	---

Table 3. 2009 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						
<i>Acadia</i>	Cadillac Mountain	1	N	1.1	-1.1	-1.1
		2	Y	0.5	-2.1	3.1
		3	Y	1.1	-0.8	3.1
		4	---	---	---	---
<i>Acadia</i>	McFarland Hill	1	Y	0.8	-2.0	0.4
		2	N	0.7	-3.5	2.1
		3	Y	1.5	-3.9	0.9
		4	N	1.7	-1.6	4.9
<i>Badlands</i>	Visitor Center	1	Y	2.3	2.3	2.3
		2	N	3.6	-1.2	8.4
		3	Y	1.1	-1.4	3.7
		4	Y	0.5	-3.6	4.5
<i>Cape Cod</i>	Cape Cod	1	---	---	---	---
		2	Y	6.2	3.7	8.8
		3	N	5.7	3.6	7.9
		4	---	---	---	---
<i>Chamizal</i>	Chamizal	1	N	1.5	-3.5	0.6
		2	Y	1.0	-2.2	0.3
		3	N	0.7	-1.1	-0.3
		4	N	0.6	-1.8	0.6
<i>Congaree</i>	Congaree Bluff	1	N	4.9	-2.3	12.0
		2	N	2.3	-0.7	5.3
		3	N	2.6	-0.5	5.7
		4	N	1.4	-4.7	7.5
<i>Cowpens</i>	State Monitor	1	N	4.3	0.8	7.8
		2	Y	0.2	-8.1	8.5
		3	Y	1.6	-3.5	6.8
		4	Y	0.7	-7.5	6.1
<i>Everglades</i>	Cutler Road	1	Y	2.9	-4.5	-1.3
		2	Y	3.9	-6.4	-1.4
		3	Y	4.6	-7.9	-1.4
		4	Y	1.5	-4.4	1.3
<i>Great Smoky Mountains</i>	Cades Cove	1	Y	0.1	-3.0	3.2
		2	Y	2.7	-1.4	6.9
		3	Y	3.3	-0.5	7.1
		4	N	0.8	-5.0	6.5
<i>Great Smoky Mountains</i>	Purchase Knob	1	---	---	---	---
		2	Y	0.5	-1.9	0.8
		3	Y	0.4	-1.6	2.4
		4	Y	0.8	-2.2	0.6

Table 3. 2009 Ozone analyzer precision and accuracy summary (continued).

National Park Unit	Site Name	Calendar Quarter	Required # of Precision Checks Met? ^a	Precision		
				Avg. Absolute Percent Difference ^{c, d}	Lower 95% Probability Limit ^f	Upper 95% Probability Limit ^f
Sites operated by cooperating state agencies						
<i>Indiana Dunes</i>	Ammunition Bunker	1	---	---	---	---
		2	Y	3.2	3.1	3.4
		3	N	5.8	-11.8	0.1
		4	---	---	---	---
<i>Mount Rainier</i>	Jackson Visitor's Center	1	Y	3.9	1.9	5.9
		2	Y	0.4	-2.0	2.9
		3	N	2.8	0.4	5.2
		4	Y	3.6	1.5	5.6
<i>Saguaro</i>	Pima County	1	N	0.5	-2.0	3.0
		2	Y	0.9	-2.5	0.8
		3	Y	0.9	-4.1	2.3
		4	Y	0.9	-3.1	1.3
<i>Theodore Roosevelt</i>	Painted Canyon Visitor Ctr	1	Y	2.4	-5.6	0.8
		2	Y	1.1	-7.0	4.8
		3	Y	1.1	-6.8	9.1
		4	Y	1.1	-3.1	0.8
<i>Wind Cave</i>	Visitor Center	1	Y	0.6	-2.5	3.8
		2	Y	0.6	-1.4	2.5
		3	Y	0.6	-1.0	1.7
		4	N	---	---	---

^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. 2009 Ozone analyzer precision and accuracy overall network summary.

Calendar Quarter	# Operational Sites	Precision ^a Average Absolute Percent Difference			Accuracy ^{b,c} Average Absolute Percent Difference		
		# 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	27	25	2	0	6	0	0
2	28	26	2	0	18	3	1
3	28	28	0	0	10	2	0
4	28	28	0	0	16	0	0
Sites operated by cooperating state agencies							
1	12	12	0	0			
2	15	14	1	0			
3	15	13	2	0			
4	12	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.