



2011 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) 2011 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 97.6%, for sulfur dioxide the average was 99.3%, and for PM_{2.5} the average was 99.2%.

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 2011, 29 of 29 ozone sites and 4 of 4 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 $\pm 7\%$ 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 2011. 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 2011. Included in the table are the number of sites whose precision and accuracy checks fell within $\pm 5\%$, $\pm 10\%$, and outside of $\pm 10\%$.

2011 GPMP Data Quality Assurance

Table 1. 2011 Data collection statistics.														
National Park Unit	Site Name	Parameter Code												
		O ₃ % valid ^a	SO ₂ % valid ^a	CO % valid ^a	NO _x % 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	SOL % valid ^a	FLOW % valid ^a
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)														
Big Bend	K-Bar Ranch Road	95.6	---	---	---	---	---	99.7	99.7	99.6	99.7	98.8	99.7	99.7
Canyonlands	Island in the Sky	95.7	---	---	---	---	---	99.6	99.6	99.6	99.8	99.5	99.7	99.8
Chiricahua	Entrance Station	94.8	---	---	---	---	---	98.2	98.2	98.3	98.3	98.0	98.2	98.4
Craters of the Moon	Visitor Center	98.9	---	---	---	---	---	98.5	99.4	99.4	99.4	---	99.5	---
Death Valley	Park Village	98.0	---	---	---	---	---	99.7	99.7	99.8	99.8	98.6	---	---
Denali	Headquarters	99.7	---	---	---	---	---	97.1	97.1	99.9	99.9	99.9	100.0	100.0
Everglades	Beard Center	---	---	---	---	---	---	99.8	99.8	91.1	99.6	96.8	99.9	99.3
Glacier	W. Glacier Horse Stables	98.6	---	---	---	---	---	97.4	97.4	98.7	98.8	98.4	98.8	98.7
Grand Canyon	The Abyss	94.3	---	---	---	---	---	99.3	99.3	99.7	99.8	99.1	99.8	99.8
Grand Teton	Science School	99.5	---	---	---	---	---	99.8	99.8	99.9	99.9	98.9	99.8	---
Great Basin	Maintenance Yard	98.8	---	---	---	---	---	64.7	76.7	98.4	96.5	96.0	98.5	98.9
Great Smoky Mtns	Clingmans Dome	99.6	---	---	---	---	---	97.4	97.4	99.8	97.7	99.8	99.9	---
Great Smoky Mtns	Cove Mountain	99.6	99.2	---	---	---	---	99.1	99.1	99.8	99.7	99.5	---	---
Great Smoky Mtns	Look Rock	98.1	---	98.9	98.8	98.5	---	99.0	99.0	99.0	99.0	98.7	96.5	72.9
Hawaii Volcanoes	Observatory	---	100.0	---	---	72.7	---	99.9	99.9	100.0	100.0	99.6	---	---
Hawaii Volcanoes	Visitor Center	---	99.9	---	---	---	---	99.9	99.9	94.7	99.9	99.6	99.9	---
Joshua Tree	Black Rock	98.6	---	---	---	---	---	98.7	98.7	97.9	95.6	98.4	98.7	98.7
Joshua Tree	Cottonwood Canyon	8.2	---	---	---	---	---	95.9	95.9	96.1	96.1	96.1	80.2	---
Lassen Volcanic	Manzanita Lake Fire Stn	97.0	---	---	---	---	---	98.7	98.7	98.8	98.8	98.4	98.8	98.9
Mammoth Cave	Houchin Meadow	98.6	98.1	88.2	---	---	---	99.9	99.9	99.9	99.2	99.7	99.9	99.9
Mesa Verde	Resource Mgmt Area	99.7	---	---	---	---	---	98.0	98.0	99.9	99.9	99.1	99.9	99.9
Mount Rainier	Tahoma Woods	99.8	---	---	---	---	---	89.7	89.7	99.8	99.8	99.7	99.3	99.9
Petrified Forest	South Entrance	99.2	---	---	---	---	---	99.7	99.7	99.7	99.8	99.3	99.8	99.8
Pinnacles	SW of East Entrance Stn	99.1	---	---	---	---	---	98.8	98.8	98.9	99.2	89.5	98.9	99.3
Rocky Mountain	Long's Peak	99.4	---	---	---	---	---	98.6	98.6	99.6	99.5	84.4	99.6	99.7
Sequoia/KCanyon	Ash Mountain	99.7	---	---	---	97.7	---	99.2	99.2	99.5	99.6	98.9	99.7	99.9
Sequoia/KCanyon	Lower Kaweah	97.8	---	---	---	---	---	80.1	99.3	92.1	99.4	90.9	99.3	---
Shenandoah	Big Meadows	97.9	---	---	---	---	---	97.5	97.5	96.1	97.5	91.2	97.8	98.0
Voyageurs	Sullivan Bay	96.1	---	---	---	---	---	78.8	78.8	97.1	97.1	99.9	98.2	99.9
Yellowstone	Old Faithful	---	---	---	---	99.2	---	99.6	99.6	99.9	99.8	---	---	---
Yellowstone	Water Tank	98.1	---	---	---	---	---	98.3	98.3	98.4	98.4	98.0	98.4	97.1
Yosemite	Turtleback Dome	97.4	---	---	---	---	---	97.6	97.6	97.5	95.3	97.5	98.0	98.0
Zion	Dalton's Wash	99.5	---	---	---	93.0	---	99.4	99.4	99.5	99.5	99.2	92.5	---
Average Network Data Collection		97.6	99.3	93.6	98.8	99.2	---	96.1	97.2	98.4	98.9	97.4	98.3	98.0
Sites operated by the NPS for the Bureau of Land Management														
Meeker	Plant Science Center	99.6	---	---	99.0	61.2	---	99.2	99.2	99.9	99.9	99.5	100.0	82.1
Rangely	Golf Course	99.5	---	---	97.1	93.7	---	99.4	99.4	99.8	99.8	49.8	99.8	99.7
Average Network Data Collection		99.6	---	---	98.1	75.0	---	99.3	99.3	99.9	99.9	74.6	99.9	89.6
Sites operated by the NPS for the U.S. Forest Service														
Walden	Chandler Ranch	99.1	99.2	---	---	---	---	0.0	99.3	99.3	99.3	---	99.3	---
Average Network Data Collection		99.1	99.2	---	---	---	---	0.0	99.3	99.3	99.3	---	99.3	---

Table 1. 2011 Data collection statistics (continued).

National Park Unit	Site Name	Parameter Code												
		O ₃ % valid ^a	SO ₂ % valid ^a	CO % valid ^a	NO _x % 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	SOL % valid ^a	FLOW % valid ^a
Sites operated by cooperating state agencies														
<i>Acadia</i>	Cadillac Mountain	97.4	---	---	---	---	---	---	---	83.8	83.8	99.9	---	---
<i>Acadia</i>	McFarland Hill	98.8	---	---	---	98.7	---	99.4	100.0	100.0	100.0	100.0	100.0	99.6
<i>Badlands</i>	Visitor Center	98.8	93.5	---	---	92.9	97.7	---	---	---	---	---	---	---
<i>Cape Cod</i>	Cape Cod	94.3	---	---	---	---	---	---	99.8	99.9	99.9	---	---	---
<i>Chamizal</i>	Chamizal	99.7	68.8	---	---	97.8	---	83.1	83.1	99.8	99.9	---	99.6	---
<i>Congaree</i>	Congaree Bluff	98.3	94.8	---	---	---	---	---	---	---	---	92.3	---	---
<i>Cowpens</i>	State Monitor	96.8	---	---	---	---	---	---	---	---	---	97.1	---	---
<i>Everglades</i>	Cutler Road	100.0	---	---	---	---	---	---	---	---	---	---	---	---
<i>Great Smoky Mtns</i>	Cades Cove	98.6	---	---	---	---	---	99.6	99.6	99.9	99.9	99.6	99.9	---
<i>Great Smoky Mountains</i>	Purchase Knob	98.4	---	---	---	---	---	---	---	---	---	---	---	---
<i>Indiana Dunes</i>	Ammunition Bunker	99.8	99.3	---	---	78.7	98.9	97.9	98.6	99.9	99.9	---	63.9	---
<i>Mount Rainier</i>	Jackson Visitor's Center	86.3	---	---	---	---	---	---	---	---	---	---	---	---
<i>Saguaro</i>	East	99.6	---	---	---	---	---	99.9	---	100.0	100.0	99.5	99.3	---
<i>Theodore Roosevelt</i>	Painted Canyon Visitor Ctr	82.8	99.5	---	---	96.3	---	69.9	99.3	99.2	99.5	99.3	99.3	99.5
<i>Wind Cave</i>	Visitor Center	99.7	---	---	---	96.7	98.8	99.4	99.4	99.5	99.6	89.0	98.6	99.7
<i>Yellowstone</i>	West Yellowstone State	---	---	86.6	76.1	94.3	---	86.8	94.3	94.3	---	---	---	---
<i>Yosemite</i>	Village	---	---	---	---	97.6	---	---	---	100.0	---	---	---	---
Average Network Data Collection		96.2	91.3	86.6	76.1	95.1	98.4	91.6	95.6	99.3	99.8	96.7	94.4	99.6
Portable ozone monitoring systems (POMS)														
<u>Carlsbad Caverns</u>	Maintenance Area	99.7	---	---	---	---	---	---	100.0	100.0	100.0	100.0	100.0	---
<u>City of Rocks</u>	Juniper Campground	99.9	---	---	---	---	---	---	99.9	99.9	99.9	99.9	92.6	---
<u>Colorado</u>	Maintenance Yard	97.2	---	---	---	---	---	---	99.9	100.0	100.0	100.0	100.0	---
<u>Cumberland Gap</u>	Hensley Settlement	99.8	---	---	---	---	---	---	98.2	90.2	90.2	99.9	100.0	---
<u>Devil's Tower</u>	Joyner Ridge Trail	98.7	---	---	---	---	---	---	100.0	100.0	100.0	100.0	100.0	---
<u>Dinosaur</u>	West Entrance Housing	97.6	---	---	---	---	---	---	98.9	99.9	99.9	99.8	99.9	---
<u>Joshua Tree</u>	Pinto Wells	90.7	---	---	---	---	---	---	100.0	100.0	99.9	100.0	99.9	97.2
<u>Kings Mountain</u>	Brown's Mountain	96.4	---	---	---	---	---	---	100.0	100.0	100.0	100.0	100.0	---
<u>Little River Canyon</u>	Canyon High	97.2	---	---	---	---	---	---	96.6	97.7	97.7	---	---	---
<u>Lyndon B. Johnson</u>	Hay Barn	99.2	---	---	---	---	---	---	100.0	100.0	100.0	100.0	100.0	---
<u>Mojave</u>	Kelso Mountains	93.6	---	---	---	---	---	---	99.9	99.9	99.9	99.9	99.9	---
<u>Olympic</u>	Deer Park	99.8	---	---	---	---	---	---	99.9	99.9	99.9	99.9	99.9	---
<u>Russell Cave</u>	Visitor Center	99.9	---	---	---	---	---	---	98.9	100.0	100.0	100.0	100.0	---
<u>Scotts Bluff</u>	Visitor Center	86.8	---	---	---	---	---	---	100.0	100.0	100.0	68.0	100.0	---
<u>Yosemite</u>	School Yard	99.8	---	---	---	---	---	---	99.7	99.9	99.9	99.9	99.9	---
Average Network Data Collection		96.7	---	---	---	---	---	---	99.4	99.3	99.3	98.1	99.4	97.2

^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
 SO₂ = sulfur dioxide
 CO = carbon monoxide
 NO_x = oxides of nitrogen
 PM_{2.5} = particulates ≤ 2.5 microns
 PM₁₀ = particulates ≤ 10 microns
 WD = wind direction
 WS = wind speed
 TMP = ambient temperature
 RH = relative humidity
 RNF = precipitation
 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. 2011 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	SOL	FLOW
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)											
Annual	Annual average	%	97.6	99.3	96.1	97.2	98.4	98.9	97.4	98.3	98.0
	# sites ≥ 75% valid	# sites (%)	29 (100)	4 (100)	32 (97)	33 (100)	33 (100)	33 (100)	31 (100)	29 (100)	21 (96)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (5)
1	Quarterly average	%	96.0	99.0	97.8	98.2	97.9	98.0	96.4	96.6	98.7
	# sites ≥ 75% valid	# sites (%)	26 (96)	4 (100)	30 (100)	30 (100)	30 (100)	30 (100)	28 (97)	26 (96)	22 (100)
	# sites < 75% valid	# sites (%)	1 (4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	1 (4)	0 (0)
2	Quarterly average	%	98.6	98.8	94.7	98.4	97.7	98.7	95.8	99.2	99.2
	# sites ≥ 75% valid	# sites (%)	28 (100)	4 (100)	29 (94)	31 (100)	30 (97)	31 (100)	28 (93)	28 (100)	22 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	2 (6)	0 (0)	1 (3)	0 (0)	2 (7)	0 (0)	0 (0)
3	Quarterly average	%	98.5	99.7	97.3	97.5	98.7	99.4	98.7	98.2	96.2
	# sites ≥ 75% valid	# sites (%)	29 (100)	4 (100)	32 (97)	32 (97)	33 (100)	33 (100)	31 (100)	29 (100)	21 (96)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	1 (3)	1 (3)	0 (0)	0 (0)	0 (0)	0 (0)	1 (5)
4	Quarterly average	%	96.7	99.8	94.7	94.7	99.1	99.2	98.6	99.1	98.1
	# sites ≥ 75% valid	# sites (%)	29 (100)	4 (100)	30 (91)	30 (91)	33 (100)	33 (100)	31 (100)	29 (100)	21 (96)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	3 (9)	3 (9)	0 (0)	0 (0)	0 (0)	0 (0)	1 (5)
Sites operated by the NPS for the Bureau of Land Management											
Annual	Annual average	%	99.6	---	99.3	99.3	99.9	99.9	74.6	99.9	86.8
	# sites ≥ 75% valid	# sites (%)	2 (100)	---	2 (100)	2 (100)	2 (100)	2 (100)	1 (50)	2 (100)	2 (100)
	# sites < 75% valid	# sites (%)	0 (0)	---	0 (0)	0 (0)	0 (0)	0 (0)	1 (50)	0 (0)	0 (0)
1	Quarterly average	%	99.9	---	99.1	99.1	99.8	99.8	79.8	99.9	99.9
	# sites ≥ 75% valid	# sites (%)	2 (100)	---	2 (100)	2 (100)	2 (100)	2 (100)	1 (50)	2 (100)	2 (100)
	# sites < 75% valid	# sites (%)	0 (0)	---	0 (0)	0 (0)	0 (0)	0 (0)	1 (50)	0 (0)	0 (0)
2	Quarterly average	%	99.7	---	99.8	99.8	99.8	99.8	67.8	99.8	99.7
	# sites ≥ 75% valid	# sites (%)	2 (100)	---	2 (100)	2 (100)	2 (100)	2 (100)	1 (50)	2 (100)	2 (100)
	# sites < 75% valid	# sites (%)	0 (0)	---	0 (0)	0 (0)	0 (0)	0 (0)	1 (50)	0 (0)	0 (0)
3	Quarterly average	%	99.2	---	98.7	98.7	100.0	100.0	51.7	100.0	98.0
	# sites ≥ 75% valid	# sites (%)	2 (100)	---	2 (100)	2 (100)	2 (100)	2 (100)	1 (50)	2 (100)	2 (100)
	# sites < 75% valid	# sites (%)	0 (0)	---	0 (0)	0 (0)	0 (0)	0 (0)	1 (50)	0 (0)	0 (0)
4	Quarterly average	%	99.4	---	99.7	99.7	99.8	99.8	99.3	99.8	32.1
	# sites ≥ 75% valid	# sites (%)	2 (100)	---	2 (100)	2 (100)	2 (100)	2 (100)	2 (100)	2 (100)	0 (0)
	# sites < 75% valid	# sites (%)	0 (0)	---	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)

Table 2. 2011 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	SOL	FLOW
Sites operated by cooperating state agencies											
Annual	Annual average	%	96.2	91.3	92.6	96.3	99.8	99.8	96.2	95.1	99.6
	# sites ≥ 75% valid	# sites (%)	15 (100)	4 (80)	7 (88)	8 (100)	9 (100)	9 (100)	6 (100)	7 (88)	3 (100)
	# sites < 75% valid	# sites (%)	0 (0)	1 (20)	1 (12)	0 (0)	0 (0)	0 (0)	0 (0)	1 (12)	0 (0)
1	Quarterly average	%	99.1	94.0	88.4	99.7	99.9	99.9	89.5	92.7	100.0
	# sites ≥ 75% valid	# sites (%)	12 (100)	5 (100)	6 (86)	7 (100)	8 (100)	8 (100)	5 (83)	7 (88)	3 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	1 (14)	0 (0)	0 (0)	0 (0)	1 (17)	1 (12)	0 (0)
2	Quarterly average	%	97.6	96.6	85.9	90.5	99.7	99.7	98.2	99.1	99.5
	# sites ≥ 75% valid	# sites (%)	15 (100)	5 (100)	5 (63)	6 (75)	9 (100)	9 (100)	6 (100)	8 (100)	3 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	3 (37)	2 (25)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
3	Quarterly average	%	98.6	93.8	96.6	96.2	99.9	99.9	97.8	99.7	99.5
	# sites ≥ 75% valid	# sites (%)	15 (100)	4 (80)	7 (88)	7 (88)	9 (100)	9 (100)	6 (100)	8 (100)	3 (100)
	# sites < 75% valid	# sites (%)	0 (0)	1 (20)	1 (12)	1 (12)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4	Quarterly average	%	88.2	80.5	99.6	99.6	99.8	99.8	99.3	88.8	99.5
	# sites ≥ 75% valid	# sites (%)	11 (85)	4 (80)	7 (100)	7 (100)	8 (100)	8 (100)	6 (100)	7 (88)	3 (100)
	# sites < 75% valid	# sites (%)	2 (15)	1 (20)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (12)	0 (0)
Portable ozone monitoring systems											
Annual	Annual average	%	96.3	---	99.3	99.4	99.3	99.3	98.1	99.4	97.2
	# sites ≥ 75% valid	# sites (%)	15 (100)	0 (0)	15 (100)	15 (100)	15 (100)	15 (100)	13 (93)	14 (100)	1 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (7)	0 (0)	0 (0)
1	Quarterly average	%	99.2	---	98.5	98.5	99.9	99.7	99.8	99.7	99.9
	# sites ≥ 75% valid	# sites (%)	6 (100)	0 (0)	6 (100)	6 (100)	6 (100)	6 (100)	6 (100)	6 (100)	1 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2	Quarterly average	%	97.7	---	99.5	99.5	98.3	98.3	95.1	98.6	90.2
	# sites ≥ 75% valid	# sites (%)	14 (100)	0 (0)	14 (100)	14 (100)	13 (93)	13 (93)	12 (92)	13 (100)	1 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	0 (0)	1 (7)	1 (7)	1 (8)	0 (0)	0 (0)
3	Quarterly average	%	96.7	---	99.3	99.6	100.0	100.0	100.0	100.0	99.9
	# sites ≥ 75% valid	# sites (%)	15 (100)	0 (0)	15 (100)	15 (100)	15 (100)	15 (100)	14 (100)	14 (100)	1 (100)
	# sites < 75% valid	# sites (%)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4	Quarterly average	%	89.1	---	99.3	99.3	99.9	99.9	99.9	99.9	98.8
	# sites ≥ 75% valid	# sites (%)	6 (86)	0 (0)	7 (100)	7 (100)	7 (100)	7 (100)	6 (100)	6 (100)	1 (100)
	# sites < 75% valid	# sites (%)	1 (14)	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: O ₃ = ozone analyzer WD = wind direction TMP = ambient temperature RNF = precipitation DTP = delta temperature SO ₂ = sulfur dioxide analyzer WS = wind speed RH = relative humidity WET = wetness SOL = solar radiation FLOW = filter pack flow rate											
<i>Note:</i> Dashed lines represent no data available for that particular parameter.											
Portable ozone monitoring systems typically operate during the summer ozone season only.											

Table 3. 2011 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 (Gaseous Pollutant Monitoring Program)									
Big Bend	K-Bar Ranch Road	1	Y	0.2	-3.4	3.8	Y	3.6	5.0
		2	Y	2.6	-5.2	0.1	N	---	---
		3	Y	1.3	-3.9	1.4	Y	2.1	-6.2
		4	Y	2.3	-5.7	1.0	N	---	---
Canyonlands	Island in the Sky	1	Y	3.1	-5.4	-0.8	N	---	---
		2	Y	4.5	-6.7	-2.3	Y	1.0	1.7
		3	Y	7.1	-9.0	-5.1	Y	0.1	-0.3
		4	Y	4.9	-7.8	-2.1	N	---	---
Chiricahua	Entrance Station	1	Y	0.3	-0.8	1.4	N	---	---
		2	Y	1.2	-0.2	2.5	Y	0.5	-1.2
		3	Y	0.2	-0.7	1.1	N	---	---
		4	Y	0.4	-3.6	2.7	Y	1.5	2.5
Craters of the Moon	Visitor Center	1	Y	4.2	-8.0	-0.4	Y	3.0	-4.3
		2	Y	1.8	0.0	3.6	N	---	---
		3	Y	3.2	1.8	4.5	Y	3.4	10.0
		4	Y	2.3	0.9	3.8	N	---	---
Death Valley	Park Village	1	N	1.8	-0.6	4.1	Y	1.0	-1.7
		2	Y	1.1	-0.5	2.7	N	---	---
		3	Y	0.0	-1.8	1.7	Y	1.3	-3.3
		4	Y	0.9	-2.9	1.0	N	---	---
Denali	Headquarters	1	Y	0.9	-2.2	0.3	N	---	---
		2	Y	1.9	-3.6	-0.3	Y	2.1	-3.0
		3	Y	1.3	-2.6	0.0	N	---	---
		4	Y	1.2	-3.1	0.8	Y	1.3	-2.5
Glacier	West Glacier Horse Stables	1	Y	0.9	-3.7	1.9	N	---	---
		2	Y	1.4	-4.9	2.0	Y	0.4	-1.7
		3	Y	1.7	-4.4	1.0	N	---	---
		4	Y	1.7	-4.3	0.9	Y	1.0	2.7
Grand Canyon	The Abyss	1	Y	4.3	-8.9	0.2	N	---	---
		2	Y	0.7	-6.4	4.9	Y	1.6	-2.5
		3	Y	3.6	1.4	5.9	N	---	---
		4	Y	2.3	-0.7	5.3	Y	1.1	-1.3
Grand Teton	Science School	1	---	---	---	---	---	---	---
		2	---	---	---	---	---	---	---
		3	Y	1.3	0.7	1.9	Y	0.9	2.1
		4	Y	2.2	0.4	4.0	N	---	---
Great Basin	Maintenance Yard	1	Y	1.2	-2.6	0.1	Y	5.2	-6.3
		2	Y	0.1	-3.2	3.5	N	---	---
		3	Y	2.9	1.6	4.2	Y	2.0	-2.3
		4	Y	2.6	1.4	3.8	N	---	---

Table 3. 2011 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 (Gaseous Pollutant Monitoring Program)									
Great Smoky Mountains	Clingmans Dome	1	---	---	---	---	---	---	---
		2	Y	0.1	-2.8	2.7	N	---	---
		3	Y	0.3	-2.0	2.6	N	---	---
		4	Y	0.5	-2.5	1.6	N	---	---
Great Smoky Mountains	Cove Mountain	1	Y	0.4	-0.7	1.6	N	---	---
		2	Y	0.0	-2.1	2.2	N	---	---
		3	Y	1.0	-2.3	0.3	N	---	---
		4	Y	0.6	-1.9	0.6	Y	3.5	4.3
Great Smoky Mountains	Look Rock	1	Y	2.8	-7.9	2.3	N	---	---
		2	Y	0.2	-3.0	2.6	Y	2.4	3.3
		3	Y	0.2	-2.0	2.4	N	---	---
		4	Y	0.0	-2.3	2.2	Y	7.1	8.8
Joshua Tree	Black Rock	1	Y	1.9	-3.2	-0.5	N	---	---
		2	Y	1.5	-2.9	-0.1	N	---	---
		3	Y	2.0	-3.6	-0.4	N	---	---
		4	Y	0.9	-2.5	0.7	N	---	---
Joshua Tree	Cottonwood Canyon	1	Y	4.2	-11.3	2.8	Y	0.9	-1.8
		2	Y	6.2	-8.3	-4.0	N	---	---
		3	Y	5.2	-11.1	0.6	N	---	---
		4	N	0.9	-3.2	5.1	N	---	---
Lassen Volcanic	Manzanita Lake Fire Station	1	Y	1.4	-4.7	1.8	Y	3.3	-4.9
		2	Y	1.7	0.2	3.2	Y	2.6	2.8
		3	Y	1.3	0.4	2.2	Y	1.9	-2.8
		4	Y	1.0	-1.4	3.4	N	---	---
Mammoth Cave	Houchin Meadow	1	Y	2.0	-2.9	-1.1	N	---	---
		2	Y	1.6	-3.3	0.1	Y	0.7	-2.8
		3	Y	3.5	-5.4	-1.6	N	---	---
		4	Y	4.0	-6.8	-1.1	Y	0.8	1.0
Mesa Verde	Resource Management Area	1	Y	0.6	-3.9	5.1	N	---	---
		2	Y	0.6	-2.8	4.0	Y	1.7	-2.0
		3	Y	0.4	-3.5	2.6	Y	0.8	1.0
		4	Y	0.3	-3.5	2.8	N	---	---
Mount Rainier	Tahoma Woods	1	Y	1.4	-3.7	0.9	N	---	---
		2	Y	1.0	-4.9	2.9	Y	3.4	-4.0
		3	Y	0.3	-4.8	4.1	N	---	---
		4	Y	0.7	-5.1	3.7	Y	4.4	5.3
Petrified Forest	South Entrance	1	Y	1.7	-4.0	0.6	N	---	---
		2	Y	1.0	-2.3	0.2	Y	1.3	-2.5
		3	Y	1.4	-2.4	-0.3	N	---	---
		4	Y	0.6	-4.3	3.0	Y	10.0	-11.1

Table 3. 2011 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 (Gaseous Pollutant Monitoring Program)									
Pinnacles	SW of East Entrance Stn	1	Y	1.6	-3.2	0.1	Y	2.6	-3.8
		2	Y	1.3	-2.6	0.0	Y	1.0	-1.2
		3	Y	1.3	-2.3	-0.3	Y	4.2	-4.9
		4	Y	1.7	-3.0	-0.3	N	---	---
Rocky Mountain	Long's Peak	1	Y	1.2	-5.1	2.6	N	---	---
		2	Y	3.9	-7.3	-0.5	Y	1.6	2.0
		3	Y	6.1	-9.7	-2.6	Y	1.9	2.5
		4	Y	3.1	-7.6	1.4	N	---	---
Sequoia and Kings Canyon	Ash Mountain	1	Y	2.2	-3.4	-0.9	N	---	---
		2	Y	1.4	-5.6	2.7	Y	3.0	-4.6
		3	Y	2.0	1.1	2.9	N	---	---
		4	Y	0.3	-3.1	3.7	Y	3.4	5.0
Sequoia and Kings Canyon	Lower Kaweah	1	Y	0.6	-1.6	0.4	N	---	---
		2	Y	0.7	-1.7	0.4	Y	1.5	-2.7
		3	Y	0.6	-1.6	0.5	N	---	---
		4	Y	1.2	-3.4	0.9	Y	1.3	-3.0
Shenandoah	Big Meadows	1	Y	2.2	-5.6	1.1	N	---	---
		2	Y	1.6	-6.3	9.5	Y	1.1	-2.5
		3	Y	4.3	1.2	7.5	N	---	---
		4	Y	3.5	-2.8	9.9	Y	2.3	5.9
Voyageurs	Sullivan Bay	1	Y	2.5	1.3	3.6	N	---	---
		2	Y	2.1	0.7	3.5	Y	1.2	1.7
		3	Y	1.4	0.0	2.8	N	---	---
		4	Y	0.5	-1.0	2.0	Y	3.0	4.7
Yellowstone	Water Tank	1	Y	0.2	-1.5	1.2	N	---	---
		2	Y	0.3	-1.7	1.0	Y	1.7	-4.1
		3	Y	0.6	-3.4	2.2	N	---	---
		4	Y	1.1	-3.2	1.1	Y	2.2	2.8
Yosemite	Turtleback Dome	1	Y	1.1	-2.3	4.5	N	---	---
		2	Y	1.6	0.5	2.7	Y	0.3	-0.7
		3	Y	2.1	1.6	2.6	N	---	---
		4	Y	1.7	0.6	2.8	Y	0.7	1.0
Zion	Dalton's Wash	1	Y	1.1	-3.7	5.8	Y	2.2	-3.3
		2	Y	1.4	-3.8	1.0	N	---	---
		3	Y	4.4	-7.3	-1.5	Y	3.3	-4.9
		4	Y	3.6	-5.9	-1.2	N	---	---

Table 3. 2011 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 NPS for the Bureau of Land Management									
Meeker	Plant Science Center	1	Y	0.1	-0.4	0.5	Y	0.3	0.6
		2	Y	0.0	0.0	0.0	Y	0.6	1.4
		3	Y	0.0	0.0	0.0	Y	---	---
		4	Y	0.0	0.0	0.0	Y	0.4	0.7
Rangely	Golf Course	1	Y	0.1	-0.4	0.5	Y	2.2	-2.3
		2	Y	0.0	0.0	0.0	Y	0.1	0.1
		3	Y	0.0	0.0	0.0	Y	0.8	1.2
		4	Y	0.0	0.0	0.0	Y	0.2	-0.6
Sites operated by the NPS for the U.S. Forest Service									
Walden	Chandler Ranch	1	---	---	---	---			
		2	---	---	---	---			
		3	---	---	---	---			
		4	Y	3.0	-4.5	-1.5			
Sites operated by cooperating state agencies									
Acadia	Cadillac Mountain	1	---	---	---	---			
		2	N	0.7	-2.0	0.6			
		3	Y	0.2	-1.7	1.2			
		4	---	---	---	---			
Acadia	McFarland Hill	1	Y	0.2	-2.6	2.1			
		2	N	---	---	---			
		3	Y	1.1	-2.4	0.1			
		4	N	---	---	---			
Badlands	Visitor Center	1	Y	2.3	-3.3	-1.2			
		2	Y	0.0	-1.6	1.6			
		3	Y	0.1	-2.2	2.4			
		4	Y	0.7	-3.0	1.6			
Cape Cod	Cape Cod	1	Y	0.5	-0.9	1.9			
		2	N	2.0	0.2	3.8			
		3	N	0.3	-9.3	8.7			
		4	Y	0.0	0.0	0.0			
Chamizal	Chamizal	1	Y	0.6	-11.7	12.9			
		2	N	1.1	-2.0	4.2			
		3	N	1.9	1.1	2.7			
		4	Y	3.0	-8.7	2.7			
Congaree	Congaree Bluff	1	N	---	---	---			
		2	N	2.0	-9.0	5.0			
		3	N	0.6	-8.3	7.1			
		4	Y	2.2	0.3	4.1			
Cowpens	State Monitor	1	Y	2.8	2.8	2.8			
		2	N	4.6	1.9	7.2			
		3	N	1.4	-5.1	7.9			
		4	Y	2.4	-5.0	9.8			

Table 3. 2011 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>Everglades</i>	Cutler Road	1	Y	1.5	-7.2	4.2
		2	Y	1.9	-4.9	1.0
		3	Y	1.3	-6.7	4.0
		4	Y	0.7	-2.0	0.7
<i>Great Smoky Mountains</i>	Cades Cove	1	Y	1.2	-1.1	3.4
		2	Y	2.2	-1.2	5.6
		3	Y	3.3	-2.2	8.8
		4	Y	1.6	-3.8	7.0
<i>Great Smoky Mountains</i>	Purchase Knob	1	---	---	---	---
		2	Y	0.2	-1.7	1.3
		3	Y	0.6	-1.0	2.2
		4	Y	1.0	-0.4	2.3
<i>Indiana Dunes</i>	Ammunition Bunker	1	---	---	---	---
		2	Y	0.9	-0.8	2.7
		3	Y	1.5	-0.9	3.8
		4	---	---	---	---
<i>Mount Rainier</i>	Jackson Visitor's Center	1	Y	3.5	2.3	4.8
		2	Y	0.6	-4.1	5.4
		3	Y	1.3	-3.0	0.5
		4	Y	4.2	-1.2	9.6
<i>Saguaro</i>	East	1	Y	0.2	-1.2	1.6
		2	Y	1.7	-3.7	0.2
		3	Y	1.2	-2.0	-0.5
		4	Y	0.8	-2.5	0.9
<i>Theodore Roosevelt</i>	Painted Canyon Visitor Ctr	1	Y	2.4	-6.2	1.5
		2	N	0.9	-3.7	2.0
		3	N	0.9	-2.3	4.1
		4	N	1.7	-2.9	-0.4
<i>Wind Cave</i>	Visitor Center	1	Y	0.1	-0.7	0.5
		2	Y	0.5	-4.3	5.3
		3	Y	0.8	-6.6	8.3
		4	Y	0.0	-0.9	0.9

Table 3. 2011 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
<p>^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.</p> <p>^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 not by an outside auditor.</p> <p>^c Percent Difference = [(analyzer - transfer standard) / transfer standard] x 100</p> <p>^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.</p> <p>^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.</p> <p>^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%.</p> <p>^g Accuracy results are presented for NPS-operated sites only.</p> <p>Operating agency key: plain text = site operated by the National Park Service <i>Italics</i> = site operated by a state agency <u>underline</u> = site operated by the National Park Service, but consisting of non-EPA certified portable instrumentation</p> <p>Color shading key: or Ideal: indicates percent difference within ± 5% or a probability limit within ± 10%. Acceptable: indicates a precision percent difference between ± 5.1-7%, an accuracy percent difference between ± 5.1-10%, or a probability limit between ± 10.1-15%. Unacceptable: indicates a precision percent difference greater than ± 7%, an accuracy percent difference greater than ± 10%, or a probability limit greater than ± 15%.</p>						

Table 4. 2011 Ozone analyzer precision and accuracy overall network summary.

Calendar Quarter	# Operational Sites	Precision ^a			Accuracy ^{b,c}		
		Average Absolute Percent Difference			Average Absolute Percent Difference		
		# Sites within ± 5%	# Sites within ± 5.1-7%	# Sites > ± 7%	# Sites within ± 5%	# Sites within ± 5.1-10%	# Sites > ± 10%
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)							
1	27	27	0	0	7	1	0
2	28	27	1	0	19	0	0
3	29	26	2	1	11	0	0
4	29	29	0	0	13	2	0
Sites operated by the NPS for the Bureau of Land Management							
1	2	2	0	0	2	0	0
2	2	2	0	0	2	0	0
3	2	2	0	0	1	0	0
4	2	2	0	0	2	0	0
Sites operated by the NPS for the U.S. Forest Service							
1	0	0	0	0			
2	0	0	0	0			
3	0	0	0	0			
4	1	1	0	0			
Sites operated by cooperating state agencies							
1	12	11	0	0			
2	15	14	0	0			
3	15	15	0	0			
4	13	12	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 7% 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.