

Table 1a

Data Collection Statistics
01/01/2018 - 12/31/2018
National Park Service Gaseous Pollutant Monitoring Program

National Park Unit	Site Name	Parameter % valid													
		O3	SO2	SO2ADD	CO	NOX	PM2.5	PM10	VWD	SWS	TMP	RH	RNF	SOL	FLOW
Big Bend	K-Bar Ranch Road	92.4	---	---	---	---	---	---	99.1	99.1	74.5	99.2	98.9	99.3	96.9
Canyonlands	Island in the Sky	94.7	---	---	---	---	---	---	97.1	97.1	97.6	99.7	99.3	99.5	99.1
Chaco Culture	Radio Repeater	94.7	---	---	---	76.8	---	---	99.6	99.6	99.6	99.7	95.1	99.7	---
Chiricahua	Entrance Station	95.0	---	---	---	---	---	---	94.1	98.8	98.8	98.9	81.4	98.8	98.8
Craters of the Moon	Visitor Center	99.0	---	---	---	---	---	---	99.4	99.3	99.9	---	---	99.7	---
Death Valley	Park Village	94.0	---	---	---	---	---	---	99.1	99.1	99.2	---	---	---	---
Denali	Headquarters	99.6	---	---	---	---	---	---	99.9	99.9	100.0	100.0	99.9	100.0	99.7
Dinosaur	West Entrance Housing	97.8	---	---	---	---	---	---	99.2	99.2	99.6	---	99.3	99.8	99.1
Everglades	Beard Center	---	---	---	---	---	---	---	97.0	97.0	100.0	99.7	99.6	97.2	95.4
Glacier	West Glacier Horse Stables	97.5	---	---	---	---	---	---	98.6	98.6	99.8	---	---	99.8	99.8
Grand Canyon	The Abyss	97.9	---	---	---	---	---	---	99.6	99.6	99.8	99.8	79.6	99.9	99.8
Grand Teton	Science School	88.7	---	---	---	---	---	---	99.6	99.6	99.8	99.8	99.4	99.8	---
Great Basin	Maintenance Yard	96.7	---	---	---	---	---	---	98.3	98.9	99.4	99.6	98.9	99.6	99.1
Great Smoky Mountains	Cades Cove	94.6	---	---	---	---	---	---	66.2	99.9	99.9	99.9	99.4	74.8	---
Great Smoky Mountains	Clingmans Dome	46.6	---	---	---	---	---	---	49.4	49.4	49.3	48.9	49.2	49.4	---
Great Smoky Mountains	Cove Mountain	99.2	---	---	---	---	---	---	98.8	98.8	97.9	97.6	99.2	---	---
Great Smoky Mountains	Look Rock	98.2	---	---	---	---	98.8	---	99.5	99.5	99.6	99.8	97.6	99.6	80.0
Great Smoky Mountains	Look Rock NCORE	---	87.7	---	83.0	---	---	---	---	---	---	---	---	---	---
Hawaii Volcanoes	Observatory / Jaggar Museum	---	88.0	88.0	---	---	30.8	---	100.0	100.0	100.0	99.0	100.0	---	---
Hawaii Volcanoes	Visitor Center	---	96.9	96.9	---	---	0.0	---	99.8	99.8	99.8	99.8	78.2	99.8	---
Joshua Tree	Cottonwood Visitor Center	75.7	---	---	---	---	59.3	---	90.1	95.5	95.8	95.8	95.5	95.8	---
Joshua Tree	Black Rock	98.7	---	---	---	---	---	---	98.8	98.8	98.6	99.5	99.0	99.5	98.8
Lassen Volcanic	Manzanita Lake Fire Stn.	96.6	---	---	---	---	---	---	86.1	90.7	99.0	99.1	98.7	99.1	92.7
Mammoth Cave	Houchin Meadow	91.8	88.9	---	85.6	---	---	---	100.0	100.0	100.0	99.5	97.0	100.0	99.8
Mesa Verde	Resource Mngment Area	89.4	---	---	---	---	---	---	99.1	99.1	99.6	99.7	93.0	99.4	97.0
Minidoka	Maintenance Building	---	---	---	---	---	87.3	---	---	99.8	99.8	99.8	---	---	---
Petrified Forest	South Entrance	98.6	---	---	---	---	---	---	99.2	99.2	99.2	---	---	95.8	97.0
Pinnacles	SW of East Entrance Stn.	98.8	---	---	---	---	---	---	98.8	98.8	99.7	99.8	99.4	97.8	98.9
Rocky Mountain	Long's Peak	99.3	---	---	---	---	---	---	99.3	99.3	97.3	97.4	99.7	98.8	99.5
Sequoia and Kings Canyon	Ash Mountain	94.8	---	---	---	---	40.7	---	92.5	98.7	99.0	99.1	98.5	99.0	98.7
Sequoia and Kings Canyon	Lower Kaweah	96.4	---	---	---	---	---	---	97.8	97.8	99.2	99.3	99.3	99.3	---
Shenandoah	Big Meadows	96.8	---	---	---	---	---	---	96.3	96.3	97.9	97.4	80.1	97.9	97.8
Voyageurs	Sullivan Bay	99.2	---	---	---	---	---	---	99.4	99.1	99.9	98.3	99.6	100.0	99.5
Yellowstone	Old Faithful Snow Lodge	---	---	---	85.0	---	93.0	---	98.5	98.5	98.9	99.0	---	---	---
Yellowstone	Water Tank	95.7	---	---	---	---	---	---	97.6	97.6	91.9	88.1	97.6	98.0	98.0
Yellowstone	West Entrance	---	---	---	80.5	80.9	97.2	---	97.7	97.7	99.8	99.8	---	---	---
Yosemite	Turtleback Dome	99.0	---	---	---	---	---	---	91.1	98.1	96.1	99.9	99.5	100.0	99.3

Table 1a (continued)

Data Collection Statistics

01/01/2018 - 12/31/2018

National Park Service Gaseous Pollutant Monitoring Program

National Park Unit	Site Name	Parameter % valid													
		O3	SO2	SO2ADD	CO	NOX	PM2.5	PM10	VWD	SWS	TMP	RH	RNF	SOL	FLOW
Zion	Dalton's Wash	83.7	---	---	---	---	---	---	95.6	95.6	99.8	---	99.5	91.5	---
Average Network Data Collection		93.6	90.4	92.4	83.5	78.8	63.4	---	95.3	97.1	96.9	97.2	94.4	96.4	97.5

Key:

O3 = Ozone

SO2 = Sulfur Dioxide

SO2Add = Sulfur Dioxide

CO = Carbon Monoxide

NOX = Oxides of Nitrogen

PM2.5 = Particulate Matter 2.5

PM10 = Particulate Matter 10

VWD = Vector Wind Direction

SWS = Scalar Wind Speed

TMP = Ambient Temperature

RH = Relative Humidity

RNF = Precipitation

SOL = Solar Radiation

FLOW = Filter Pack Flow Rate

Performance Goals:

Quarterly Criteria:

100% of sites, >= 85% valid data capture

90% of sites, >= 90% valid data capture

80% of sites, >= 95% valid data capture

Monthly Criteria:

100% of sites, >= 60% valid data capture

90% of sites, >= 75% valid data capture

80% of sites, >= 85% valid data capture

Font color key:

Black: 85% - 100% data recovery

Blue: 75% - 84.9% data recovery

Orange: 60% - 74.9% data recovery

Red: 0% - 59.9% data recovery

Table 1b

Data Collection Statistics
01/01/2018 - 12/31/2018
Sites Operated by the NPS for the BLM

National Park Unit	Site Name	Parameter % valid													
		O3	SO2	SO2ADD	CO	NOX	PM2.5	PM10	VWD	SWS	TMP	RH	RNF	SOL	FLOW
Meeker	Plant Science	94.1	---	---	---	93.9	65.9	---	99.4	99.4	100.0	100.0	99.4	100.0	99.5
Rangely	Golf Course	97.6	---	---	---	97.6	98.4	---	99.8	99.8	99.9	99.9	99.3	99.9	---
Average Network Data Collection		95.8	---	---	---	95.8	82.2	---	99.6	99.6	100.0	100.0	99.4	100.0	99.5

Key:

O3 = Ozone

SO2 = Sulfur Dioxide

SO2Add = Sulfur Dioxide

CO = Carbon Monoxide

NOX = Oxides of Nitrogen

PM2.5 = Particulate Matter 2.5

PM10 = Particulate Matter 10

VWD = Vector Wind Direction

SWS = Scalar Wind Speed

TMP = Ambient Temperature

RH = Relative Humidity

RNF = Precipitation

SOL = Solar Radiation

FLOW = Filter Pack Flow Rate

Performance Goals:

Quarterly Criteria:

100% of sites, >= 85% valid data capture

90% of sites, >= 90% valid data capture

80% of sites, >= 95% valid data capture

Monthly Criteria:

100% of sites, >= 60% valid data capture

90% of sites, >= 75% valid data capture

80% of sites, >= 85% valid data capture

Font color key:

Black: 85% - 100% data recovery

Blue: 75% - 84.9% data recovery

Orange: 60% - 74.9% data recovery

Red: 0% - 59.9% data recovery

Table 1c

Data Collection Statistics
01/01/2018 - 12/31/2018
Portable Ozone Monitoring Systems (POMS)

National Park Unit	Site Name	Parameter % valid													
		O3	SO2	SO2ADD	CO	NOX	PM2.5	PM10	VWD	SWS	TMP	RH	RNF	SOL	FLOW
Carlsbad Caverns	Maintenance Area	98.1	---	---	---	---	---	---	---	100.0	100.0	100.0	100.0	100.0	---
Joshua Tree	Pinto Wells	99.5	---	---	---	---	---	---	---	99.9	100.0	100.0	99.9	100.0	---
Mojave	Kelso Mountains	100.0	---	---	---	---	---	---	---	100.0	100.0	100.0	100.0	100.0	---
Average Network Data Collection		99.2	---	---	---	---	---	---	---	100.0	100.0	100.0	100.0	100.0	---

Key:

O3 = Ozone
 SO2 = Sulfur Dioxide
 SO2Add = Sulfur Dioxide
 CO = Carbon Monoxide

NOX = Oxides of Nitrogen
 PM2.5 = Particulate Matter 2.5
 PM10 = Particulate Matter 10
 VWD = Vector Wind Direction
 SWS = Scalar Wind Speed

TMP = Ambient Temperature
 RH = Relative Humidity
 RNF = Precipitation
 SOL = Solar Radiation
 FLOW = Filter Pack Flow Rate

Performance Goals:

Quarterly Criteria:

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

Monthly Criteria:

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

Font color key:

Black: 85% - 100% data recovery
 Blue: 75% - 84.9% data recovery
 Orange: 60% - 74.9% data recovery
 Red: 0% - 59.9% data recovery

Table 2. Ozone Analyzer Precision and Accuracy Summary
Sites Operated by the National Park Service
National Park Service Gaseous Pollutant Monitoring Program, 2018

National Park Unit	Site Name	Calendar Quarter	Precision				As-Found Verification Multi-Point		
			Required No. of Precision Checks Met? ¹	Avg. Absolute Percent Difference ^{3,4}	Lower 95% Probability Limit ⁶	Upper 95% Probability Limit ⁶	Accuracy Check Performed During the Quarter? ²	Avg. Absolute Percent Difference ^{3,4}	Max. Absolute Percent Difference ⁵
Big Bend	K-Bar Ranch Road	1	Y	0.8	-0.8	2.4	Y	1.6	2.0
		2	Y	0.4	-1.7	0.9	Y	1.5	2.7
		3	Y	1.6	-3.2	0.0	N	—	—
		4	Y	0.4	-2.5	1.7	N	—	—
Canyonlands	Island in the Sky	1	Y	0.4	-0.2	1.1	N	—	—
		2	Y	0.3	-0.5	1.2	Y	0.3	0.5
		3	Y	0.2	-1.4	0.9	Y	1.1	2.0
		4	Y	0.8	0.0	1.5	N	—	—
Chaco Culture	Radio Repeater	1	Y	2.0	1.0	3.0	Y	0.9	1.2
		2	Y	1.8	0.2	3.4	Y	0.5	0.7
		3	Y	2.2	-0.2	4.7	Y	0.2	0.3
		4	Y	4.0	2.9	5.0	Y	2.1	2.4
Chiricahua	Entrance Station	1	Y	0.2	-2.3	2.7	Y	1.4	2.0
		2	Y	2.6	-4.2	-1.0	N	—	—
		3	Y	2.5	-6.1	1.2	Y	1.3	2.0
		4	Y	0.3	-3.3	2.7	N	—	—
Craters of the Moon	Visitor Center	1	Y	0.0	-1.5	1.4	N	—	—
		2	Y	0.4	-1.7	0.9	N	—	—
		3	Y	0.6	-1.6	0.3	Y	1.0	1.3
		4	Y	0.2	-2.7	3.1	Y	0.6	0.8
Denali	Headquarters	1	Y	1.7	-2.4	-1.0	N	—	—
		2	Y	1.9	-2.6	-1.2	Y	0.3	0.6
		3	Y	1.1	-2.6	0.3	Y	1.4	1.7
		4	Y	0.1	-0.8	0.6	N	—	—
Death Valley	Park Village	1	Y	0.2	-5.0	5.5	Y	1.2	1.4
		2	Y	1.8	-1.1	4.7	N	—	—
		3	Y	0.4	-1.1	2.0	Y	1.5	1.6
		4	Y	1.0	0.0	2.1	N	—	—
Dinosaur	West Entrance Housing	1	Y	1.1	-2.7	0.5	N	—	—
		2	Y	1.8	-3.5	-0.2	Y	0.2	0.7
		3	Y	0.8	-3.9	5.5	Y	0.9	1.5
		4	Y	1.5	-3.4	0.4	N	—	—
Glacier	West Glacier Horse Stables	1	Y	0.3	-0.8	1.4	N	—	—
		2	Y	0.9	-2.1	0.3	N	—	—
		3	Y	0.8	-1.9	0.2	Y	0.4	0.5
		4	Y	0.3	-1.6	1.0	Y	0.5	1.5
Great Basin	Maintenance Yard	1	Y	0.0	-2.5	2.4	N	—	—
		2	Y	2.7	-6.7	1.2	Y	2.3	4.8
		3	Y	2.2	-4.8	0.4	N	—	—
		4	Y	0.9	-4.1	2.4	Y	2.9	4.5

Table 2 (continued). Ozone Analyzer Precision and Accuracy Summary
Sites Operated by the National Park Service
National Park Service Gaseous Pollutant Monitoring Program, 2018

National Park Unit	Site Name	Calendar Quarter	Precision				As-Found Verification Multi-Point		
			Required No. of Precision Checks Met? ¹	Avg. Absolute Percent Difference ^{3,4}	Lower 95% Probability Limit ⁶	Upper 95% Probability Limit ⁶	Accuracy Check Performed During the Quarter? ²	Avg. Absolute Percent Difference ^{3,4}	Max. Absolute Percent Difference ⁵
Grand Canyon	The Abyss	1	Y	0.6	-1.9	0.7	Y	0.3	0.4
		2	Y	0.4	-1.3	0.4	N	—	—
		3	Y	1.1	-2.3	0.0	Y	0.4	0.7
		4	Y	0.8	-2.3	0.7	N	—	—
Great Smoky Mountains	Cades Cove	1	Y	0.8	-2.7	1.1	N	—	—
		2	Y	0.5	-2.1	1.2	Y	2.9	3.5
		3	Y	0.2	-1.0	0.7	N	—	—
		4	Y	0.7	-2.6	1.2	Y	0.3	0.4
Great Smoky Mountains	Clingmans Dome	1	—	—	—	—	—	—	—
		2	Y	3.3	-1.1	7.8	N	—	—
		3	Y	3.8	1.0	6.7	N	—	—
		4	Y	4.3	-1.2	9.8	Y	4.1	4.8
Great Smoky Mountains	Cove Mountain	1	Y	0.2	-1.2	0.7	N	—	—
		2	Y	0.0	-0.9	0.9	Y	0.8	1.2
		3	Y	0.9	-1.6	-0.1	N	—	—
		4	Y	0.3	-1.2	1.8	Y	0.9	1.4
Great Smoky Mountains	Look Rock	1	Y	0.1	-1.3	1.2	N	—	—
		2	Y	0.6	-1.9	0.7	Y	0.8	1.1
		3	Y	1.3	-3.1	0.5	N	—	—
		4	Y	1.0	-3.9	1.9	Y	2.4	2.6
Grand Teton	Science School	1	Y	0.2	-1.8	2.1	N	—	—
		2	Y	0.7	-3.0	1.6	N	—	—
		3	Y	0.2	-1.3	0.9	Y	0.5	0.8
		4	Y	0.9	-4.4	2.7	N	—	—
Joshua Tree	Black Rock	1	Y	1.0	-2.3	0.3	Y	1.9	2.5
		2	Y	1.0	-2.5	0.6	N	—	—
		3	Y	0.8	-2.8	1.2	Y	1.1	1.9
		4	Y	0.3	-1.7	1.1	Y	1.1	2.2
Joshua Tree	Cottonwood Visitor Center	1	N	3.0	-2.1	8.1	N	—	—
		2	Y	4.8	1.8	7.8	N	—	—
		3	Y	1.6	-9.9	6.7	Y	5.7	9.2
		4	Y	0.6	-3.5	2.4	Y	4.6	5.0
Lassen Volcanic	Manzanita Lake Fire Stn.	1	Y	1.3	-2.2	-0.3	Y	0.4	0.4
		2	Y	1.5	-2.3	-0.7	N	—	—
		3	Y	0.8	-0.9	2.6	Y	0.7	1.0
		4	Y	0.9	-1.2	2.9	Y	3.7	4.0
Mammoth Cave	Houchin Meadow	1	Y	1.4	-2.8	0.0	N	—	—
		2	Y	2.1	-3.9	-0.2	Y	3.1	4.3
		3	Y	1.1	-4.2	1.9	N	—	—
		4	Y	1.1	-4.5	2.2	Y	4.4	6.1

Table 2 (continued). Ozone Analyzer Precision and Accuracy Summary
Sites Operated by the National Park Service
National Park Service Gaseous Pollutant Monitoring Program, 2018

National Park Unit	Site Name	Calendar Quarter	Precision				As-Found Verification Multi-Point		
			Required No. of Precision Checks Met? ¹	Avg. Absolute Percent Difference ^{3,4}	Lower 95% Probability Limit ⁶	Upper 95% Probability Limit ⁶	Accuracy Check Performed During the Quarter? ²	Avg. Absolute Percent Difference ^{3,4}	Max. Absolute Percent Difference ⁶
Mesa Verde	Resource Mngment Area	1	Y	0.2	-0.9	1.3	N	—	—
		2	Y	0.0	-2.6	2.6	N	—	—
		3	Y	2.2	-3.0	7.3	Y	1.7	6.2
		4	N	0.7	-0.6	2.0	Y	0.3	0.6
Petrified Forest	South Entrance	1	Y	0.7	-0.5	1.8	Y	0.7	1.1
		2	Y	0.6	-0.5	1.6	N	—	—
		3	Y	0.0	-1.1	1.1	Y	0.4	0.7
		4	Y	0.5	-0.7	1.7	N	—	—
Pinnacles	SW of East Entrance Stn.	1	Y	2.0	-4.1	0.2	N	—	—
		2	Y	3.1	-4.6	-1.7	N	—	—
		3	Y	0.2	-2.8	3.3	Y	2.2	3.7
		4	Y	0.8	-1.2	2.8	Y	1.1	1.5
Rocky Mountain	Long's Peak	1	Y	0.2	-1.9	1.5	Y	0.9	1.4
		2	Y	0.0	-1.9	1.9	N	—	—
		3	Y	0.1	-1.8	1.9	Y	1.5	1.6
		4	Y	1.6	0.2	3.1	N	—	—
Sequoia and Kings Canyon	Ash Mountain	1	Y	0.1	-1.2	0.9	N	—	—
		2	Y	1.3	-2.5	-0.1	Y	0.9	1.3
		3	Y	2.1	-4.8	0.5	N	—	—
		4	Y	2.0	-4.7	0.6	Y	1.8	2.6
Sequoia and Kings Canyon	Lower Kaweah	1	—	—	—	—	—	—	—
		2	Y	1.6	0.5	2.7	Y	0.5	0.9
		3	Y	2.1	0.4	3.8	N	—	—
		4	Y	1.9	0.8	3.1	Y	0.8	1.8
Shenandoah	Big Meadows	1	Y	0.8	-2.8	1.1	N	—	—
		2	Y	0.6	-2.7	1.6	Y	2.1	2.8
		3	Y	1.1	-5.0	2.8	Y	2.3	2.8
		4	Y	0.7	-3.3	1.9	N	—	—
Voyageurs	Sullivan Bay	1	Y	0.3	-1.1	0.5	N	—	—
		2	Y	0.0	-1.2	1.1	Y	0.7	1.2
		3	Y	1.0	-0.3	2.3	N	—	—
		4	Y	1.2	0.0	2.4	Y	0.2	0.3

**Table 2 (continued). Ozone Analyzer Precision and Accuracy Summary
Sites Operated by the National Park Service National Park Service
Gaseous Pollutant Monitoring Program, 2018**

National Park Unit	Site Name	Calendar Quarter	Precision				As-Found Verification Multi-Point		
			Required No. of Precision Checks Met? ¹	Avg. Absolute Percent Difference ^{3,4}	Lower 95% Probability Limit ⁶	Upper 95% Probability Limit ⁶	Accuracy Check Performed During the Quarter? ²	Avg. Absolute Percent Difference ^{3,4}	Max. Absolute Percent Difference ⁶
Yellowstone	Water Tank	1	Y	1.2	0.1	2.3	N	—	—
		2	Y	2.9	-0.6	6.4	N	—	—
		3	Y	4.8	2.3	7.4	Y	0.7	1.2
		4	Y	4.6	2.3	7.0	N	—	—
Yosemite	Turtleback Dome	1	Y	0.2	-1.5	1.8	N	—	—
		2	Y	0.4	-1.4	0.5	N	—	—
		3	Y	0.9	-3.8	2.0	Y	0.7	1.3
		4	Y	0.0	-1.3	1.4	Y	0.6	1.2
Zion	Dalton's Wash	1	N	0.3	-5.6	4.9	N	—	—
		2	Y	2.3	0.8	3.8	Y	1.1	2.0
		3	Y	1.2	-0.6	2.9	N	—	—
		4	Y	0.7	-0.5	2.0	Y	0.5	1.3

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:

☐ Ideal: indicates a 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%

1. 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.³ According to NPS Standard Operating Procedures, the pollutant analyzer must respond within 10% of the transfer standard.

2. Accuracy 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). 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.³ 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.

3. Percent Difference = ((analyzer - transfer std)/transfer std)x100

4. 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.

5. Maximum Absolute Percent Difference is the highest percent difference from the points of a multipoint (or accuracy) calibration.

6. 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%.