

Table 1a

Data Collection Statistics

01/01/2021 - 12/31/2021

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	93.0	---	---	---	---	---	---	95.6	95.6	97.5	97.1	97.2	97.6	88.1
Canyonlands	Island in the Sky	99.2	---	---	---	---	---	---	99.1	99.1	99.5	99.9	99.6	99.6	99.1
Carlsbad Caverns	Biology Building	99.0	---	---	---	---	---	---	98.2	98.2	95.0	94.5	97.3	99.5	---
Chaco Culture	Radio Repeater	96.6	---	---	---	97.4	---	---	99.2	99.2	99.6	99.6	99.4	99.6	---
Chiricahua	Entrance Station	98.7	---	---	---	---	---	---	77.6	99.7	99.7	99.7	99.4	99.7	99.7
Craters of the Moon	Visitor Center	99.0	---	---	---	---	---	---	99.6	99.6	99.7	---	---	99.7	---
Death Valley	Park Village	98.6	---	---	---	---	---	---	79.5	79.5	99.3	---	---	---	---
Denali	Headquarters	99.5	---	---	---	---	---	---	100.0	100.0	100.0	100.0	100.0	100.0	99.6
Dinosaur	West Entrance Housing	96.4	---	---	---	---	---	---	99.2	99.2	99.7	---	99.7	99.9	99.5
Everglades	Beard Center	---	---	---	---	---	---	---	36.3	99.9	98.8	98.9	99.7	100.0	97.9
Glacier	West Glacier Horse Stables	98.8	---	---	---	---	---	---	98.2	98.2	99.6	---	---	99.6	99.2
Grand Canyon	The Abyss	98.3	---	---	---	---	---	---	99.8	99.8	99.8	99.9	89.6	83.6	99.5
Grand Teton	Science School	99.2	---	---	---	---	---	---	99.5	99.5	75.3	99.9	99.5	99.9	---
Great Basin	Maintenance Yard	98.7	---	---	---	---	---	---	98.8	98.8	99.2	99.3	98.6	99.3	99.1
Great Smoky Mountains	Cades Cove	96.5	---	---	---	---	---	---	99.3	99.7	99.7	100.0	99.4	100.0	---
Great Smoky Mountains	Clingmans Dome	93.1	---	---	---	---	---	---	95.5	95.5	94.9	94.9	95.1	94.7	---
Great Smoky Mountains	Cove Mountain	99.4	---	---	---	---	---	---	97.9	98.8	99.0	99.0	97.5	---	---
Great Smoky Mountains	Look Rock	98.9	---	---	---	---	99.3	---	99.3	99.3	99.7	99.7	98.9	99.9	97.5
Great Smoky Mountains	Look Rock NCORE	---	94.8	---	91.2	---	---	---	---	---	---	---	---	---	---
Hawaii Volcanoes	Visitor Center	---	94.9	94.4	---	---	60.4	---	99.2	99.2	99.2	95.1	98.9	99.3	---
Joshua Tree	Black Rock	96.0	---	---	---	---	---	---	99.3	99.3	99.8	99.8	99.5	99.8	99.4
Joshua Tree	Cottonwood Canyon	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lassen Volcanic	Manzanita Lake Fire Stn.	95.0	---	---	---	---	---	---	25.7	95.3	97.1	97.4	97.1	97.4	96.5
Mammoth Cave	Houchin Meadow	96.2	96.5	---	85.9	---	---	---	99.0	99.9	99.8	97.2	89.0	99.9	99.7
Mesa Verde	Resource Management Area	92.7	---	---	---	---	---	---	95.8	95.8	96.5	96.6	96.2	96.6	95.9
Petrified Forest	South Entrance	92.7	---	---	---	---	---	---	99.6	99.6	100.0	---	---	100.0	99.5
Pinnacles	SW of East Entrance Stn.	92.3	---	---	---	---	---	---	99.2	99.2	99.8	99.9	75.9	99.9	89.6
Rocky Mountain	Longs Peak	99.1	---	---	---	---	---	---	99.0	99.0	99.9	99.7	99.8	100.0	94.8
Sequoia and Kings Canyon	Ash Mountain	92.3	---	---	---	---	91.0	---	92.2	92.2	92.4	92.4	83.6	92.4	92.3
Sequoia and Kings Canyon	Lower Kaweah	78.7	---	---	---	---	---	---	58.8	58.8	83.3	83.4	55.0	83.4	---
Shenandoah	Big Meadows	98.6	---	---	---	---	---	---	97.6	97.6	99.7	98.8	99.5	99.7	99.6
Voyageurs	Sullivan Bay	99.0	---	---	---	---	---	---	99.0	99.0	99.7	99.8	88.9	99.8	97.2
Yellowstone	Old Faithful Snow Lodge	---	---	---	79.1	71.5	90.1	---	92.0	92.0	92.7	92.7	---	---	---
Yellowstone	Water Tank	98.4	---	---	---	---	---	---	98.3	98.3	98.3	98.3	98.2	98.6	98.6
Yellowstone	West Entrance	---	---	---	79.8	85.3	94.2	---	98.7	98.7	99.8	99.8	---	---	---
Yosemite	Turtleback Dome	97.9	---	---	---	---	---	---	66.8	99.0	99.9	100.0	90.0	100.0	99.5
Zion	Dalton's Wash	98.4	---	---	---	---	---	---	98.6	98.6	98.8	---	98.7	98.8	---

Table 1a (continued)

Data Collection Statistics

01/01/2021 - 12/31/2021

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
Average Network Data Collection		96.5	95.4	94.4	84.0	84.7	87.0	---	91.2	96.6	97.5	97.7	94.5	98.0	97.4

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

01/01/2021 - 12/31/2021

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
Rangely	Golf Course	92.3	---	---	---	97.2	99.4	---	99.8	99.8	99.8	99.8	99.2	99.9	---
Average Network Data Collection		92.3	---	---	---	97.2	99.4	---	99.8	99.8	99.8	99.8	99.2	99.9	---

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
01/01/2021 - 12/31/2021
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
Guadalupe Mountains	Maintenance Area	82.6	---	---	---	---	---	---	85.1	85.1	85.1	85.0	85.1	---
Joshua Tree	Pinto Wells	93.0	---	---	---	---	41.5	99.8	99.8	100.0	100.0	100.0	100.0	---
Average Network Data Collection		87.8	---	---	---	---	41.5	99.8	92.4	92.6	92.6	92.5	92.6	---

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, 2021**

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	0.4	-2.0	2.9	N	—	—
		2	Y	0.9	-2.9	1.0	N	—	—
		3	Y	1.0	-2.9	1.0	Y	2.6	3.1
		4	Y	0.9	-2.0	0.1	N	—	—
Canyonlands	Island in the Sky	1	Y	1.4	-2.4	-0.4	Y	1.6	2.5
		2	Y	1.5	-2.3	-0.7	N	—	—
		3	Y	2.1	-2.8	-1.4	N	—	—
		4	Y	1.5	-2.8	-0.1	Y	0.5	0.9
Carlsbad Caverns	Biology Building	1	Y	0.5	-1.8	2.8	Y	0.8	1.2
		2	Y	0.9	-1.9	0.1	N	—	—
		3	Y	0.1	-1.7	1.5	Y	0.4	0.6
		4	Y	0.5	-0.4	1.4	N	—	—
Chaco Culture	Radio Repeater	1	Y	1.2	-2.5	4.8	Y	0.8	1.3
		2	Y	1.6	-0.3	3.4	Y	1.1	1.6
		3	Y	0.3	-0.5	1.0	Y	0.2	0.5
		4	Y	1.3	-3.3	0.6	Y	0.6	1.0
Chiricahua	Entrance Station	1	Y	1.7	-0.7	4.1	Y	0.9	1.9
		2	Y	1.1	-0.5	2.7	N	—	—
		3	Y	0.8	-1.0	2.6	N	—	—
		4	Y	0.4	-1.4	2.3	N	—	—
Craters of the Moon	Visitor Center	1	Y	0.9	0.3	1.6	N	—	—
		2	Y	0.4	-0.4	1.3	Y	1.4	2.3
		3	Y	0.1	-0.7	0.9	N	—	—
		4	Y	1.3	-1.5	4.0	Y	0.5	0.8
Denali	Headquarters	1	Y	2.3	-3.5	-1.2	N	—	—
		2	Y	2.1	-3.1	-1.2	N	—	—
		3	Y	0.3	-2.0	1.3	Y	1.1	1.5
		4	Y	1.4	-2.8	0.0	N	—	—
Death Valley	Park Village	1	Y	0.7	-1.9	0.6	N	—	—
		2	Y	0.6	-2.2	1.0	Y	0.1	0.3
		3	Y	0.2	-1.6	1.2	N	—	—
		4	Y	0.2	-2.3	2.6	N	—	—
Dinosaur	West Entrance Housing	1	Y	2.1	-3.3	-1.0	Y	0.3	0.4
		2	Y	3.3	-4.7	-1.9	N	—	—
		3	Y	4.5	-7.5	-1.5	N	—	—
		4	Y	0.6	-3.2	2.0	Y	0.2	0.2
Glacier	West Glacier Horse Stables	1	Y	1.4	-0.7	3.4	N	—	—
		2	Y	0.1	-4.5	4.3	Y	0.2	0.4
		3	Y	1.2	-3.4	0.9	N	—	—
		4	Y	0.7	-2.4	1.0	N	—	—

**Table 2 (continued). Ozone Analyzer Precision and Accuracy Summary
Sites Operated by the National Park Service
National Park Service Gaseous Pollutant Monitoring Program, 2021**

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
Great Basin	Maintenance Yard	1	Y	0.5	-0.8	1.7	Y	1.2	1.5
		2	Y	1.6	-3.6	0.4	N	—	—
		3	Y	3.3	-4.5	-2.0	Y	0.2	0.3
		4	Y	2.3	-3.8	-0.8	N	—	—
Grand Canyon	The Abyss	1	Y	2.0	-5.1	1.0	Y	1.7	2.2
		2	Y	1.4	-3.0	0.2	Y	1.7	1.9
		3	Y	2.0	-2.8	-1.3	N	—	—
		4	Y	1.3	-2.2	-0.4	N	—	—
Great Smoky Mountains	Cades Cove	1	Y	0.9	-0.9	-2.7	N	—	—
		2	Y	1.6	-1.6	4.8	Y	0.8	2.1
		3	Y	0.5	-4.6	3.7	N	—	—
		4	Y	0.5	-0.6	1.6	Y	1.3	2.4
Great Smoky Mountains	Clingmans Dome	1	—	—	—	—	—	—	—
		2	Y	1.7	-4.7	8.2	Y	1.6	2.9
		3	Y	1.2	-6.2	8.5	N	—	—
		4	Y	1.4	-7.4	4.7	N	—	—
Great Smoky Mountains	Cove Mountain	1	Y	0.3	-1.1	0.5	N	—	—
		2	Y	0.1	-1.0	0.8	Y	0.7	1.8
		3	Y	1.4	-2.3	-0.5	N	—	—
		4	Y	0.1	-1.4	1.2	Y	0.8	0.9
Great Smoky Mountains	Look Rock	1	Y	1.1	0.3	1.9	N	—	—
		2	Y	0.8	-1.2	2.7	Y	0.8	1.6
		3	Y	0.5	0.0	1.0	N	—	—
		4	Y	1.0	0.2	1.8	Y	0.7	1.5
Grand Teton	Science School	1	Y	2.4	-3.5	-1.3	N	—	—
		2	Y	1.8	-3.5	-0.1	Y	0.9	1.3
		3	Y	1.2	-2.5	0.0	N	—	—
		4	Y	0.1	-1.4	1.2	Y	0.5	1.5
Joshua Tree	Black Rock	1	Y	0.5	-0.2	1.2	N	—	—
		2	Y	0.4	-0.7	1.6	Y	0.5	0.8
		3	Y	1.3	-2.2	-0.4	N	—	—
		4	Y	0.5	-1.2	0.2	N	—	—
Joshua Tree	Cottonwood Visitor Center	1	Y	2.2	-3.1	-1.4	N	—	—
		2	Y	1.6	-4.5	1.2	Y	0.3	0.6
		3	Y	2.9	-5.0	-0.7	N	—	—
		4	Y	3.2	-6.1	-0.3	N	—	—
Lassen Volcanic	Manzanita Lake Fire Stn.	1	Y	2.9	2.0	3.8	N	—	—
		2	Y	1.0	-0.3	2.2	Y	2.0	2.6
		3	Y	1.7	0.7	2.7	N	—	—
		4	Y	0.6	-1.0	2.2	N	—	—

**Table 2 (continued). Ozone Analyzer Precision and Accuracy Summary
Sites Operated by the National Park Service
National Park Service Gaseous Pollutant Monitoring Program, 2021**

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
Mammoth Cave	Houchin Meadow	1	Y	1.6	-2.4	-0.8	Y	0.3	0.5
		2	Y	1.6	-3.0	-0.1	Y	0.6	0.8
		3	Y	0.7	-0.9	2.2	N	—	—
		4	Y	1.0	0.3	1.7	Y	1.0	2.3
Mesa Verde	Resource Management Area	1	Y	4.4	-7.6	-1.2	Y	0.9	2.1
		2	Y	0.5	-2.0	3.1	Y	0.7	0.8
		3	Y	0.4	-0.9	1.7	N	—	—
		4	Y	0.7	-0.3	1.6	N	—	—
Petrified Forest	South Entrance	1	Y	1.1	0.1	2.1	Y	0.2	0.3
		2	N	0.6	-0.2	1.5	N	—	—
		3	Y	3.3	-6.5	0.0	N	—	—
		4	Y	2.3	-3.6	-1.1	N	—	—
Pinnacles	SW of East Entrance Stn.	1	Y	1.7	-5.2	1.7	N	—	—
		2	Y	1.0	-3.2	1.3	Y	1.5	3.2
		3	Y	0.6	-2.5	1.3	N	—	—
		4	Y	0.9	-3.5	1.7	Y	0.2	0.6
Rocky Mountain	Longs Peak	1	Y	3.0	-5.7	-0.3	Y	0.8	1.0
		2	Y	2.5	-5.3	0.4	N	—	—
		3	Y	3.1	-5.4	-0.8	N	—	—
		4	Y	3.0	-4.5	-1.6	N	—	—
Sequoia and Kings Canyon	Ash Mountain	1	Y	0.8	-1.8	0.1	N	—	—
		2	Y	1.7	-2.8	-0.7	N	—	—
		3	Y	0.7	-2.4	0.9	Y	0.3	0.7
		4	Y	1.1	-2.5	0.2	N	—	—
Sequoia and Kings Canyon	Lower Kaweah	1	—	—	—	—	—	—	—
		2	Y	0.3	-0.5	1.1	N	—	—
		3	N	0.0	-6.9	6.9	Y	0.3	0.8
		4	Y	0.5	-3.6	2.6	N	—	—
Shenandoah	Big Meadows	1	Y	4.5	-5.7	-3.2	N	—	—
		2	Y	2.3	-5.2	0.6	Y	3.5	3.7
		3	Y	2.7	-5.1	-0.2	Y	0.4	0.8
		4	Y	1.9	-3.5	-0.4	N	—	—

**Table 2 (continued). Ozone Analyzer Precision and Accuracy Summary
Sites Operated by the National Park Service
National Park Service Gaseous Pollutant Monitoring Program, 2021**

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
Voyageurs	Sullivan Bay	1	Y	1.2	-2.1	-0.3	N	—	—
		2	Y	1.5	-2.5	-0.6	N	—	—
		3	Y	1.2	-3.6	1.2	Y	0.3	0.6
		4	Y	0.9	-3.7	1.8	N	—	—
Yellowstone	Water Tank	1	Y	1.8	-3.5	-0.1	N	—	—
		2	Y	1.8	-3.1	-0.6	Y	0.4	0.7
		3	Y	1.0	-2.0	0.0	N	—	—
		4	Y	1.0	-0.7	2.7	Y	2.0	3.0
Yosemite	Turtleback Dome	1	Y	0.3	-1.4	2.0	N	—	—
		2	Y	1.7	-0.6	3.9	Y	0.8	1.6
		3	Y	2.8	0.2	5.4	N	—	—
		4	Y	1.6	-2.2	5.5	Y	1.8	2.2
Zion	Dalton's Wash	1	Y	0.8	-0.2	1.8	Y	1.9	2.2
		2	Y	2.0	-3.8	-0.3	N	—	—
		3	Y	2.9	-5.1	-0.7	Y	0.3	0.5
		4	Y	1.4	-2.4	-0.4	N	—	—

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

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%.