Table 1. 2021 Site Specifications.

National Park Unit	Site Name	State	NPS Abbr.	CASTNET Abbr.	AQS ID Number	Latitude (degrees north)	Longitude (degrees west)	Elev. (m)	O_3 Years[a]	SO_2	CO	NO_X/ NO_Y	PM	WS/ WD	TMP	RH	RNF	SOL	Filter Pack[b]
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)																			
Big Bend	K-Bar Ranch Road	TX	BIBE-KB	BBE401	48-043-0101	29.3028	103.1778	1057	32	---	---	---	---	X	X	X	X	X	X
Canyonlands	Island in the Sky	UT	CANY-IS	CAN407	49-037-0101	38.4583	109.8214	1794	30	---	---	---	---	X	X	X	X	X	X
Carlsbad Caverns	Biology Building	NM	CAVE-BB	---	35-015-0010	32.1783	104.4406	1357	3	---	---	---	---	X	X	X	X	X	---
Chaco Culture	Radio Repeater	NM	CHCU-RR	CHC432	35-045-0020	36.0350	107.9042	1965	5	---	---	X	---	X	X	X	X	X	---
Chiricahua	Entrance Station	AZ	CHIR-ES	CHA467	04-003-8001	32.0094	109.3892	1569	31	---	---	---	---	X	X	X	X	X	X
Craters of the Moon	Visitor Center	ID	CRMO-VC	CRM435	16-023-0101	43.4606	113.5622	1815	30	---	---	---	---	X	X	---	---	X	---
Death Valley	Park Village	CA	DEVA-PV	DEV412	06-027-0101	36.5092	116.8481	125	29	---	---	---	---	X	X	---	---	---	---
Denali	Headquarters	AK	DENA-HQ	DEN417	02-068-0003	63.7233	148.9675	663	35	---	---	---	---	X	X	X	X	X	X
Dinosaur	West Entrance Housing	UT	DINO-WE	DIN431	49-047-1002	40.4372	109.3047	1463	21	---	---	---	---	X	X	---	X	X	X
Everglades	Beard Center	FL	EVER-BC	EVE419	12-086-0030	25.3911	80.6808	1	---	---	---	---	---	X	X	X	X	X	X
Glacier	West Glacier Horse Stables	MT	GLAC-WG	GLR468	30-029-8001	48.5103	113.9969	964	30	---	---	---	---	X	X	---	---	X	X
Grand Canyon	The Abyss	AZ	GRCA-AS	GRC474	04-005-8001	36.0586	112.1836	2073	29	---	---	---	---	X	X	X	X	X	X
Grand Teton	Science School	WY	GRTE-SS	GRT434	56-039-0008	43.6708	110.5994	2105	11	---	---	---	---	X	X	X	X	X	---
Great Basin	Maintenance Yard	NV	GRBA-MY	GRB411	32-033-0101	39.0050	114.2158	2058	29	---	---	---	---	X	X	X	X	X	X
Great Smoky Mountains	Cades Cove	TN	GRSM-CC	---	47-009-0102	35.6042	83.7831	564	29	---	---	---	---	X	X	X	X	X	---
Great Smoky Mountains	Clingmans Dome	TN	GRSM-CD	---	47-155-0102	35.5619	83.4981	2021	29	---	---	---	---	X	X	X	X	X	---
Great Smoky Mountains	Cove Mountain	TN	GRSM-CM	---	47-155-0101	35.6967	83.6086	1243	34	---	---	---	---	X	X	X	X	---	---
Great Smoky Mountains	Look Rock NCore	TN	GRSM-LN	GRS420	47-009-0101	35.6336	83.9417	801	---	X	X	X	---	---	---	---	---	---	---
Great Smoky Mountains	Look Rock	TN	GRSM-LR	GRS420	47-009-0101	35.6336	83.9417	801	34	---	---	---	X	X	X	X	X	X	X
Guadalupe Mountains	Maintenance Area	TX	GUMO-MA	---	48-109-0002	31.8914	-104.8097	1701	3	---	---	---	---	X	X	X	X	X	---
Hawaii Volcanoes	Visitor Center	HI	HAVO-VC	---	15-001-0005	19.4308	155.2578	1215	---	X	---	---	X	X	X	X	X	X	---
Joshua Tree	Black Rock	CA	JOTR-BR	JOT403	06-071-9002	34.0694	116.3889	1243	29	---	---	---	---	X	X	X	X	X	X
Joshua Tree	Cottonwood Visitor Center	CA	JOTR-CV	---	06-065-0010	33.7472	115.8201	943	4	---	---	---	X	X	X	X	X	X	---
Joshua Tree	Pinto Wells	CA	JOTR-PW	---	06-065-1004	33.9397	115.4108	326	16	---	---	---	---	X	X	X	---	X	---
Lassen Volcanic	Manzanita Lake Fire Station	CA	LAVO-ML	LAV410	06-089-3003	40.5400	121.5764	1755	35	---	---	---	---	X	X	X	X	X	X
Mammoth Cave	Houchin Meadow	KY	MACA-HM	MAC426	21-061-0501	37.1317	86.1431	230	25	X	X	X	---	X	X	X	X	X	X
Mesa Verde	Resource Management Area	CO	MEVE-RM	MEV405	08-083-0101	37.1983	108.4906	2170	29	---	---	---	---	X	X	X	X	X	X
Petrified Forest	South Entrance	AZ	PEFO-SE	PET427	04-017-0119	34.8225	109.8950	1712	20	---	---	---	---	X	X	---	---	X	X

Table 1. 2021 Site Specifications (continued).

National Park Unit	Site Name	State	NPS Abbr.	CASTNET Abbr.	AQS ID Number	Latitude (degrees north)	Longitude (degrees west)	Elev. (m)	O_3 Years[a]	SO_2	CO	NO_X/ NO_Y	PM	WS/ WD	TMP	RH	RNF	SOL	Filter Pack[b]
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)																			
Pinnacles	SW of East Entrance Station	CA	PINN-ES	PIN414	06-069-0003	36.4833	121.1569	317	35	---	---	---	---	X	X	X	X	X	X
Rocky Mountain	Longs Peak	CO	ROMO-LP	ROM406	08-069-0007	40.2710	105.5456	2742	38	---	---	---	---	X	X	X	X	X	X
Sequoia and Kings Canyon	Ash Mountain	CA	SEKI-AS	SEK430	06-107-0009	36.4894	118.8292	510	23	---	---	---	X	X	X	X	X	X	X
Sequoia and Kings Canyon	Lower Kaweah	CA	SEKI-LK	---	06-107-0006	36.5658	118.7772	1890	38	---	---	---	---	X	X	X	X	X	---
Shenandoah	Big Meadows	VA	SHEN-BM	SHN418	51-113-0003	38.5231	78.4347	1068	39	---	---	---	---	X	X	X	X	X	X
Voyageurs	Sullivan Bay	MN	VOYA-SB	VOY413	27-137-0034	48.4128	92.8292	427	26	---	---	---	---	X	X	X	X	X	X
Yellowstone	Old Faithful Snow Lodge	WY	YELL-OS	---	56-039-1013	44.4582	110.8253	2230	---	---	X	X	X	X	X	X	---	---	---
Yellowstone	West Entrance	MT	YELL-WS	---	30-031-0017	44.6569	111.0894	2030	---	---	X	X	X	X	X	X	---	---	---
Yellowstone	Water Tank	WY	YELL-WT	YEL408	56-039-1011	44.5653	110.4003	2430	26	---	---	---	---	X	X	X	X	X	X
Yosemite	Turtleback Dome	CA	YOSE-TD	YOS404	06-043-0003	37.7133	119.7061	1599	29	---	---	---	---	X	X	X	X	X	X
Zion	Dalton's Wash	UT	ZION-DW	ZIO433	49-053-0130	37.1983	113.1506	1213	18	---	---	---	---	X	X	---	---	---	---
Sites operated by the NPS for the Bureau of Land Management																			
Rangely	Golf Course	CO	RANG-GC	---	08-103-0006	40.0869	108.7614	1655	12	---	---	X	X	X	X	X	X	X	---
Sites operated by cooperating state agencies																			
Acadia	Cadillac Mountain	ME	ACAD-CM	---	23-009-0102	44.3517	68.2269	466	27	---	---	---	---	X	X	X	---	---	---
Acadia	McFarland Hill	ME	ACAD-MH	ACA416	23-009-0103	44.3772	68.2608	153	24	X	X	X	X	X	X	X	X	X	X
Badlands	Visitor Center	SD	BADL-VC	---	46-071-1001	43.7436	101.9414	739	17	X	---	---	X	---	---	---	---	---	---
Cape Cod	Cape Cod	MA	CACO-XX	---	25-001-0002	41.9758	70.0247	41	35	---	---	---	---	X	X	X	---	X	---
Chamizal	Chamizal	TX	CHAM-XX	---	48-141-0044	31.7656	106.4550	1128	30	---	---	---	---	X	X	X	---	X	---
Congaree	Congaree Bluff	SC	COSW-BL	---	45-079-0021	33.8147	80.7811	34	22	---	---	---	---	---	---	---	---	---	---
Everglades	Cutler Road	FL	EVER-CR	---	12-086-0029	25.5861	80.3269	4	37	---	---	---	---	---	---	---	---	---	---
Great Smoky Mountains	Purchase Knob	NC	GRSM-PK	---	37-087-0036	35.5900	83.0775	1550	27	---	---	---	---	---	---	---	---	---	---
Indiana Dunes	Ammunition Bunker	IN	INDU-AB	---	18-089-0022	41.6067	87.3047	183	29	X	---	---	X	X	X	X	---	X	---

Table 1. 2021 Site Specifications (continued).

National Park Unit	Site Name	State	NPS Abbr.	CASTNET Abbr.	AQS ID Number	Latitude (degrees north)	Longitude (degrees west)	Elev. (m)	O_3 Years[a]	SO_2	CO	NO_X/ NO_Y	PM	WS/ WD	TMP	RH	RNF	SOL	Filter Pack[b]
Sites operated by cooperating state agencies																			
Mount Rainier	Jackson Visitor's Center	WA	MORA-JV	---	53-053-0012	46.7853	121.7378	1615	24	---	---	---	---	---	---	---	---	---	---
Saguaro	East	AZ	SAGU-EA	---	04-019-0021	32.1744	110.7364	938	30	---	---	---	---	X	X	X	---	X	---
Theodore Roosevelt	Painted Canyon, VC	ND	THRO-VC	THR422	38-007-0002	46.8947	103.3778	840	24	X	---	---	X	X	X	X	X	X	X
Wind Cave	Visitor Center	SD	WICA-VC	WNC429	46-033-0132	43.5575	103.4839	1288	18	---	---	---	X	X	X	X	X	X	X
Yosemite	Village	CA	YOSE-VI	---	06-043-1001	37.7458	119.6028	1216	---	---	---	---	X	---	---	---	---	---	---

[a] The values in this column represent the number of years an ozone analyzer has been operational at the site.

[b] A filter pack is a part of the CASTNET network and is used to measure dry deposition using the "inferential method." This method combines air quality concentration data with meteorological measurements and land use functions to compute deposition velocities. Ambient air is drawn across the filter at either 3.0 or 1.5 liters per minute. The filter is then analyzed in a lab to yield weekly average concentrations of particulate sulfate (SO_4^{2-}), particulate nitrate (NO_3^-), particulate ammonium (NH_4^+), sulfur dioxide (SO_2), and nitric acid (HNO_3). In some cases, the positive ions Na^+, K^+, Ca^{2+}, and Mg^{2+} are also measured from the filter samples.

Operating agency key: plain text = site operated by the National Park Service
italics = site operated by a state agency
underline = site operated by the National Park Service, but consisting of non-EPA certified portable instrumentation

Parameter key: O_3 = ozone (ppb)
SO_2 = sulfur dioxide (ppb)
CO = carbon monoxide (ppm)
NO_X = oxides of nitrogen (ppb)
PM = particulate matter ($\mu g/m^3$)
WS = wind speed (m/s)
WD = wind direction (degrees)
TMP = air temperature (degrees C)
RH = relative humidity (%)
RNF = precipitation (mm/hr)
SOL = solar radiation ($watts/m^2$)

Note : Dashed lines indicate parameter not measured at that site.

Table 2. 2021 Summary of 8-hour average ozone concentrations (ppb).

National Park Unit	Site Name	Valid Number of Days	1st Highest	2nd Highest	3rd Highest	4th Highest	# Days with 8-Hour Average O_3 Values ≥70 ppb[a]
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)							
Big Bend	K-Bar Ranch Road	327	63	63	62	61	0
Canyonlands	Island in the Sky	363	75	71	69	69	2
Carlsbad Caverns	Biology Building	359	85	80	79	**77**	**15**
Chaco Culture	Radio Repeater	360	73	72	71	**71**	**4**
Chiricahua	Entrance Station	359	72	67	66	66	1
Craters of the Moon	Visitor Center	359	71	70	70	70	1
Death Valley	Park Village	356	79	76	76	**75**	**8**
Denali	Headquarters	363	62	55	54	53	0
Dinosaur	West Entrance Housing	357	73	68	68	68	1
Glacier	West Glacier Horse Stables	360	61	59	57	57	0
Grand Canyon	The Abyss	353	65	65	65	64	0
Grand Teton	Science School	362	69	68	67	67	0
Great Basin	Maintenance Yard	359	80	77	69	68	2
Great Smoky Mountains	Cades Cove	249	62	60	60	57	0
Great Smoky Mountains	Clingmans Dome	172	64	62	59	57	0
Great Smoky Mountains	Cove Mountain	361	68	64	63	62	0
Great Smoky Mountains	Look Rock	360	71	67	67	64	1
Joshua Tree	Black Rock	353	93	88	84	**80**	**37**
Joshua Tree	Cottonwood Visitor Center	317	72	72	68	68	2
Lassen Volcanic	Manzanita Lake Fire Station	340	77	76	76	**75**	**9**
Mammoth Cave	Houchin Meadow	358	62	62	61	61	0
Mesa Verde	Resource Management Area	334	75	72	68	67	2
Petrified Forest	South Entrance	339	71	69	67	66	1
Pinnacles	SW of East Entrance Station	339	70	69	69	68	0
Rocky Mountain	Longs Peak	364	82	80	77	**77**	**14**
Sequoia and Kings Canyon	Ash Mountain	337	100	96	95	**93**	**77**
Sequoia and Kings Canyon	Lower Kaweah	168	89	89	86	**86**	**55**
Shenandoah	Big Meadows	359	64	63	63	61	0
Voyageurs	Sullivan Bay	362	65	63	62	60	0
Yellowstone	Water Tank	358	74	68	68	65	1
Yosemite	Turtleback Dome	356	86	84	82	**80**	**17**
Zion	Dalton's Wash	357	90	73	69	67	2
Sites operated by the NPS for the Bureau of Land Management							
Rangely	Golf Course	338	76	70	69	69	1
Sites operated by cooperating state agencies							
Acadia	Cadillac Mountain	229	80	76	72	69	3
Acadia	McFarland Hill	359	75	72	63	63	2
Badlands	Visitor Center	327	57	57	55	54	0
Cape Cod	Cape Cod	351	78	73	71	69	3
Chamizal	Chamizal	358	73	73	73	69	3
Congaree	Congaree Bluff	272	61	61	58	58	0
Everglades	Cutler Road	349	63	58	56	56	0

Table 2. 2021 Summary of 8-hour average ozone concentrations (ppb) (continued).

National Park Unit	Site Name	Valid Number of Days	1st Highest	2nd Highest	3rd Highest	4th Highest	# Days with 8-Hour Average O_3 Values ≥70 ppb[a]
Sites operated by cooperating state agencies							
Great Smoky Mountains	Purchase Knob	243	67	67	63	63	0
Indiana Dunes	Ammunition Bunker	349	76	75	72	70	3
Mount Rainier	Jackson Visitor's Center	316	66	59	59	58	0
Saguaro	East	362	73	71	70	67	2
Theodore Roosevelt	Painted Canyon, VC	348	71	70	70	69	1
Wind Cave	Visitor Center	350	66	66	66	65	0
Portable ozone monitoring systems (POMS)[b]							
Guadalupe Mountains	Maintenance Area	150	78	72	71	**71**	**4**
Joshua Tree	Pinto Wells	196	70	69	68	68	0

[a] The primary and secondary National Ambient Air Quality Standard for ozone is 0.070 ppm over an 8-hour period. (An exceedance of the standard occurs when an 8-hour average ozone concentration is greater than or equal to 70 ppb. A violation of the standard occurs when the 3-year average of the fourth highest daily maximum 8-hour average ozone concentration equals or exceeds 70 ppb.) Exceedances of the standard are in red.

[b] The gaseous Pollutant Monitoring Program Portable Ozone Monitoring Systems (POMS) do not meet EPA standards for regulatory monitoring. However, ozone summary statistics from portable systems can be compared to EPA standards for reference purposes.

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: Red = 4th highest 8-hour average ozone concentration >70 ppb, >3 days with 8-hour average >70 ppb
Bold = Ozone summary statistics for POMS are highlighted bold where exceedances occurred. These sites should be compared to EPA standards for reference purposes only.

Table 3. 2021 Ozone violation summary - primary standard[a,b].

National Park Unit	Site Name	2019-2021	2018-2020	2017-2019	2016-2018	2015-2017	2014-2016	2013-2015
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)								
Big Bend	K-Bar Ranch Road	61	63	64	63	62	62	64
Canyonlands	Island in the Sky	66	66	65	65	64	64	65
Carlsbad Caverns	Biology Building	**74**	**(73)**	**(74)**	---	---	---	---
Chaco Culture	Radio Repeater	68	67	(65)	(66)	(64)	---	---
Chiricahua	Entrance Station	66	66	66	66	65	65	68
Craters of the Moon	Visitor Center	64	64	63	63	60	60	61
Death Valley	Park Village	**72**	**73**	**72**	**(73)**	(70)	70	70
Denali	Headquarters	52	52	52	50	50	53	54
Dinosaur	West Entrance Housing	67	66	70	**72**	**72**	68	**81**
Glacier	West Glacier Horse Stables	54	53	53	52	53	53	(54)
Grand Canyon	The Abyss	62	64	64	65	66	67	69
Grand Teton	Science School	61	59	59	60	59	59	59
Great Basin	Maintenance Yard	68	69	67	66	64	64	68
Great Smoky Mountains	Cades Cove	56	58	60	62	61	60	59
Great Smoky Mountains	Clingmans Dome	(60)	(62)	(62)	(63)	(63)	(65)	(65)
Great Smoky Mountains	Cove Mountain	60	62	64	67	67	68	67
Great Smoky Mountains	Look Rock	62	63	65	67	67	67	65
Joshua Tree	Black Rock	**82**	**86**	**88**	**89**	**87**	**86**	**86**
Joshua Tree	Cottonwood Visitor Center	(66)	**(71)**	**(73)**	**(82)**	---	---	---
Lassen Volcanic	Manzanita Lake Fire Station	67	68	66	68	64	65	66
Mammoth Cave	Houchin Meadow	59	59	61	63	64	64	63
Mesa Verde	Resource Management Area	66	68	67	68	66	65	66
Petrified Forest	South Entrance	66	67	66	65	63	64	66
Pinnacles	SW of East Entrance Station	66	65	64	68	68	69	68
Rocky Mountain	Longs Peak	**71**	70	68	70	68	69	70
Sequoia and Kings Canyon	Ash Mountain	**90**	**88**	**86**	**89**	**89**	**89**	**89**
Sequoia and Kings Canyon	Lower Kaweah	**(82)**	**83**	**82**	**86**	**84**	**(84)**	**(84)**
Shenandoah	Big Meadows	57	57	60	63	63	63	62
Voyageurs	Sullivan Bay	56	56	56	55	54	55	57
Yellowstone	Water Tank	64	63	62	62	61	60	62
Yosemite	Turtleback Dome	**77**	**79**	**77**	**79**	**75**	**74**	74
Zion	Dalton's Wash	65	66	66	66	65	(65)	(67)
Sites operated by the NPS for the Bureau of Land Management								
Rangely	Golf Course	66	65	65	64	63	63	73

Table 3. 2021 Ozone violation summary - primary standard[a,b] (continued).

National Park Unit	Site Name	2018-2020	2018-2020	2017-2019	2016-2018	2015-2017	2014-2016	2013-2015
Sites operated by cooperating state agencies								
Acadia	Cadillac Mountain	67	65	69	70	**71**	66	67
Acadia	McFarland Hill	60	60	64	63	64	62	65
Badlands	Visitor Center	57	60	62	63	61	58	58
Cape Cod	Cape Cod	64	64	67	69	(69)	(65)	(67)
Chamizal	Chamizal	**71**	**74**	**74**	**71**	69	67	68
Congaree	Congaree Bluff	55	54	55	55	55	55	55
Everglades	Cutler Road	58	61	61	62	(61)	61	63
Great Smoky Mountains	Purchase Knob	61	62	63	64	64	65	65
Indiana Dunes	Ammunition Bunker	69	70	68	70	68	67	65
Mount Rainier	Jackson Visitor's Center	58	61	64	64	63	(59)	(60)
Saguaro	East	67	69	69	**71**	69	68	69
Theodore Roosevelt	Painted Canyon, VC	60	57	60	59	60	58	58
Wind Cave	Visitor Center	61	60	61	62	61	58	59

[a] The 2015 primary and secondary National Ambient Air Quality Standard for ozone is 0.070 ppm over an 8-hour period. This standard was used for the 2018-2020 period through 2014-2016. (An exceedance of the standard occurs when an 8-hour average ozone concentration is greater than or equal to 71 ppb. A violation of the standard occurs when the 3-year average of the fourth highest daily maximum 8-hour average ozone concentration equals or exceeds 71 ppb.)

[b] The 2008 primary and secondary National Ambient Air Quality Standard for ozone is 0.075 ppm over an 8-hour period. This standard was used for the 2013-2015 period through 2008-2010. (An exceedance of the standard occurs when an 8-hour average ozone concentration is greater than or equal to 76 ppb. A violation of the standard occurs when the 3-year average of the fourth highest daily maximum 8-hour average ozone concentration equals or exceeds 76 ppb.)

Operating agency key: plain text = site operated by the National Park Service
italics = site operated by a state agency

Color shading key: **Red** = ozone violation based on the standard in place at that time

Note : A number in parenthesis ( ) indicates that data completeness was not met. The primary standard required 90 percent data completeness, on average, during the 3-year period, with no single year within the period having less than 75 percent data completeness. This data completeness requirement would have to be satisfied in order to determine that the standard has been met at a monitoring site. However, calendar years with less than 75 percent data completeness are included in the computation if the annual fourth-highest daily maximum 8-hour concentration is greater than the level of the standard. A site could be found not to have met the standard with less than complete data.

Table 4. 2021 Summary of indices for resource injury (SUM06 and W126).

National Park Unit	Site Name	O_3 % Valid	SUM06[a] (ppm-hr)	SUM06 Period	W126[b] (ppm-hr)	W126 Period	NPS W126[c] (ppm-hr)	NPS W126 Period
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)								
Big Bend	K-Bar Ranch Road	93.0	2.7	May-July	5.3	April-June	6.1	April-June
Canyonlands	Island in the Sky	99.2	16.9	July-September	12.8	June-August	14.0	June-August
Carlsbad Caverns	Biology Building	99.0	23.3	May-July	16.7	May-July	17.9	May-July
Chaco Culture	Radio Repeater	96.6	15.9	July-September	13.4	May-July	14.5	May-July
Chiricahua	Entrance Station	98.7	10.7	May-July	10.9	May-July	12.0	May-July
Craters of the Moon	Visitor Center	99.0	19.1	July-September	13.4	July-September	14.6	July-September
Death Valley	Park Village	98.6	22.3	July-September	16.6	July-September	17.9	July-September
Denali	Headquarters	99.5	0.2	February-April	1.8	February-April	2.4	March-May
Dinosaur	West Entrance Housing	96.4	18.3	July-September	12.8	July-September	14.0	July-September
Glacier	West Glacier Horse Stables	98.8	1.7	May-July	2.5	July-September	3.1	July-September
Grand Canyon	The Abyss	98.3	9.3	May-July	11.1	May-July	12.2	May-July
Grand Teton	Science School	99.2	12.8	July-September	9.7	July-September	10.8	July-September
Great Basin	Maintenance Yard	98.7	14.1	June-August	12.2	June-August	13.4	June-August
Great Smoky Mountains	Cades Cove	96.5	1.1	March-May	3.7	March-May	4.4	March-May
Great Smoky Mountains	Clingmans Dome	93.1	1.1	May-July	2.3	May-July	2.9	May-July
Great Smoky Mountains	Cove Mountain	99.4	2.2	May-July	4.6	March-May	5.4	March-May
Great Smoky Mountains	Look Rock	98.9	4.6	May-July	4.9	March-May	5.8	March-May
Joshua Tree	Black Rock	96.0	40.4	June-August	27.5	June-August	29.0	June-August
Joshua Tree	Cottonwood Visitor Center	89.0	9.9	May-July	9.5	March-May	13.1	May-July
Lassen Volcanic	Manzanita Lake Fire Station	95.0	32.9	July-September	20.8	July-September	22.2	July-September
Mammoth Cave	Houchin Meadow	96.2	2.9	April-June	4.0	April-June	4.8	April-June
Mesa Verde	Resource Management Area	92.7	14.3	May-July	12.7	May-July	13.8	May-July
Petrified Forest	South Entrance	92.7	5.7	March-May	8.3	March-May	12.7	April-June
Pinnacles	SW of East Entrance Station	92.3	9.4	August-October	7.8	July-September	8.7	July-September
Rocky Mountain	Longs Peak	99.1	27.8	July-September	19.2	July-September	20.5	July-September
Sequoia and Kings Canyon	Ash Mountain	92.3	66.7	June-August	49.5	June-August	51.1	June-August
Sequoia and Kings Canyon	Lower Kaweah	78.7	57.8	June-August	39.6	June-August	41.3	June-August
Shenandoah	Big Meadows	98.6	3.2	May-July	4.8	March-May	5.6	March-May
Voyageurs	Sullivan Bay	99.0	1.7	May-July	3.0	May-July	3.7	May-July
Yellowstone	Water Tank	98.4	12.7	July-September	9.7	July-September	10.8	July-September
Yosemite	Turtleback Dome	97.9	44.0	July-September	26.6	July-September	28.1	July-September
Zion	Dalton's Wash	98.4	13.7	May-July	12.2	May-July	13.4	May-July
Sites operated by the NPS for the Bureau of Land Management								
Rangely	Golf Course	92.3	18.2	June-August	13.6	June-August	14.8	June-August
Sites operated by cooperating state agencies								
Acadia	Cadillac Mountain	98.3	4.7	April-June	4.6	April-June	5.3	April-June
Acadia	McFarland Hill	98.2	2.3	April-June	3.0	April-June	3.7	April-June
Badlands	Visitor Center	90.4	0.4	July-September	0.8	May-July	1.6	April-June
Cape Cod	Cape Cod	97.0	5.5	June-August	4.5	April-June	5.1	April-June
Chamizal	Chamizal	98.1	6.9	June-August	7.4	May-July	8.2	May-July
Congaree	Congaree Bluff	99.1	1.4	March-May	3.1	March-May	3.5	March-May
Everglades	Cutler Road	97.4	1.0	March-May	2.4	March-May	2.9	March-May
Great Smoky Mountains	Purchase Knob	95.3	4.7	April-June	6.2	March-May	6.7	March-May

Table 4. 2021 Summary of indices for resource injury (SUM06 and W126) (continued).

National Park Unit	Site Name	O_3 % Valid	SUM06[a] (ppm-hr)	SUM06 Period	W126[b] (ppm-hr)	W126 Period	NPS W126[c] (ppm-hr)	NPS W126 Period
Indiana Dunes	Ammunition Bunker	95.9	7.4	June-August	6.3	June-August	7.0	June-August
Mount Rainier	Jackson Visitor's Center	92.7	0.3	May-July	2.6	March-May	3.1	March-May
Saguaro	East	99.3	20.3	May-July	14.3	May-July	14.7	May-July
Theodore Roosevelt	Painted Canyon, VC	95.4	14.1	June-August	10.4	June-August	10.9	June-August
Wind Cave	Visitor Center	96.3	8.6	June-August	8.7	June-August	9.2	June-August
Portable ozone monitoring systems (POMS)								
Guadalupe Mountains	Maintenance Area	82.6	11.4	June-August	10.0	June-August	11.1	June-August
Joshua Tree	Pinto Wells	93.0	18.1	April-June	13.2	April-June	14.4	April-June

[a] SUM06 exposure index represents the 0800-2000 hourly ozone concentrations equaling or exceeding 0.06 ppm. The value reported here represents a three-month maximum value during the ozone season. Units are ppm-hr.

[b] W126 exposure index represents 0800-2000 hourly ozone concentrations where each concentration is weighted by a function that gives greater emphasis to the higher hourly concentrations while still including the lower ones. The value reported here represents a three-month maximum value during the ozone season. Units are ppm-hr. For more information on the W126 exposure index go to https://www.nps.gov/subjects/air/glossary.htm

[c] NPS W126 represents a three-month maximum value during the growing season (March to September) with a monthly completeness criteria of 50%, a three-month completeness criteria of 75%, and a seasonal completeness criteria of 60%.

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

Table 5. 2021 Summary of sulfur dioxide data.

National Park Unit	Site Name	Highest Daily Maximum 1-Hour Average Concentration[a] (ppb)						Highest Daily Maximum 3-Hour Average Concentration[b] (ppb)				
		1st Highest	2nd Highest	3rd Highest	4th Highest	99th Percentile Value	No. of Days with 1-Hr Average >75 ppb	1st Highest	2nd Highest	3rd Highest	4th Highest	No. of Days with 3-Hr Maximum >549 ppb
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)												
Great Smoky Mountains	Look Rock NCore	3.9	3.2	1.7	1.4	1	0	1.4	1.2	1.1	0.9	0
Hawaii Volcanoes *	Visitor Center	281.4	271.9	250.1	236.2	**236**	14	146.6	127.4	97.5	93.7	0
Mammoth Cave	Houchin Meadow	3.9	3.5	2.8	2.7	3	0	2.4	2.3	2.2	2.1	0
Sites operated by cooperating state agencies												
Acadia	McFarland Hill	0.8	0.8	0.5	0.5	1	0	0.6	0.3	0.3	0.3	0
Badlands	Visitor Center	8.5	3.1	1.9	1.8	2	0	5.8	1.8	1.5	1.5	0
Indiana Dunes	Ammunition Bunker	43.9	42.1	40.8	32.2	32	0	29.7	27.7	24.4	24.3	0
Theodore Roosevelt	Painted Canyon, VC	8.6	6.7	6.2	5.5	6	0	5.4	4.7	4.5	4.5	0

[a] The primary hourly National Ambient Air Quality Standard for sulfur dioxide is a daily maximum 1-hour average of 75 ppb. (An exceedance of the standard occurs when a daily maximum 1-hour average exceeds 75 ppb. A violation of the standards occurs when the 3-year average of the 99th percentile of the daily maximum 1-hour average exceeds 75 ppb.)

[b] The secondary National Ambient Air Quality Standard for sulfur dioxide is 0.5 ppm over a 3-hour period not to be exceeded more than once per year. (A value greater than 0.5 ppm, 549 ppb, or 1,300 $\mu g/m^3$ exceeds the standard.) (40 CFR 50.5.)

* This site collected sulfur dioxide data using a range that is not EPA approved.

Operating agency key: plain text = site operated by the National Park Service
italics = site operated by a state agency

Color shading key: **Red** >75 ppb 99th percentile value, or >549 ppb 3-hour average

Table 6. 2021 Summary of carbon monoxide data.

National Park Unit	Site Name	Highest Daily Maximum 1-Hour Average Concentration[a] (ppm)					Highest Daily Maximum 8-Hour Average Concentration[b] (ppm)				
		1st Highest	2nd Highest	3rd Highest	4th Highest	No. of Days with 1-Hr Average >35 ppm	1st Highest	2nd Highest	3rd Highest	4th Highest	No. of Days with 8-Hr Average >9 ppm
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)											
Great Smoky Mountains	Look Rock NCore	0.529	0.382	0.349	0.311	0	0.354	0.352	0.296	0.295	0
Mammoth Cave	Houchin Meadow	0.519	0.431	0.409	0.389	0	0.487	0.400	0.368	0.362	0
Yellowstone	Old Faithful Snow Lodge	0.569	0.553	0.515	0.376	0	0.565	0.541	0.496	0.460	0
Yellowstone	West Yellowstone	1.714	1.694	1.544	1.510	0	1.150	0.758	0.735	0.707	0
Sites operated by cooperating state agencies											
Acadia	McFarland Hill	0.429	0.402	0.331	0.311	0	0.392	0.352	0.309	0.305	0

[a] The primary hourly National Ambient Air Quality Standard for carbon monoxide is a daily maximum 1-hour average of 35 ppm. (An exceedance of the standard occurs when a daily maximum 1-hour average exceeds 35 ppm. A violation of the standard occurs when a daily maximum 1-hour average exceeds 35 ppm more than once in a calendar year.)

[b] The primary National Ambient Air Quality Standard for carbon monoxide is 9 ppm over an 8-hour period. (An exceedance of the standard occurs when an 8-hour average exceeds 9 ppm. A violation of the standard occurs when a daily maximum 8-hour average exceeds 9 ppm more than once in a calendar year.)
(40CFR 50.8.)

Operating agency key: plain text = site operated by the National Park Service
italics = site operated by a state agency

Color shading key: **Red** >35 ppm 1-hour average or >9 ppm 8-hour average

Table 7. 2021 Summary of nitrogen dioxide data.

National Park Unit	Site Name	Highest Daily Maximum 1-Hour Average Concentrations[ab] (ppb)						
		1st Highest	2nd Highest	3rd Highest	4th Highest	98th Percentile Value	No. of Days with 1-Hour Average >100 ppb	Annual Arithmetic Mean
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)								
Chaco Culture	Radio Repeater	7.1	5.2	5.1	4.7	4	0	1
Great Smoky Mountains	Look Rock NCore	11.4	11.2	7.3	6.9	6	0	1
Mammoth Cave	Houchin Meadow	20.5	14.7	14.5	12.5	12	0	2
Yellowstone	Old Faithful Snow Lodge	37.5	27.5	24.2	22.0	15	0	1
Yellowstone	West Yellowstone	33.9	28.7	23.3	21.8	21	0	2
Sites operated by the NPS for the Bureau of Land Management								
Rangely	Golf Course	26.6	26.0	25.4	25.0	22	0	2

[a] The primary hourly National Ambient Air Quality Standard for nitrogen dioxide is a daily maximum 1-hour average of 100 ppb. (An exceedance of the standard occurs when a daily maximum 1-hour average exceeds 100 ppb. A violation of the standard occurs when the 3-year average of the 98th percentile of the daily maximum 1-hour average exceeds 100 ppb. (40 CFR 50.11)

[b] The primary and secondary annual National Ambient Air Quality Standard for nitrogen dioxide is an annual arithmetic mean of 53 ppb. (An exceedance and violation of the standard occurs when an annual arithmetic mean of NO_2 concentrations is greater than 53 ppb.) (40 CFR 50.11.)

Operating agency key: plain text = site operated by the National Park Service
italics = site operated by a state agency

Color shading key: **Red** >53 ppb annual arithmetic mean or >100 ppb 98th percentile value

Table 8. 2021 Summary of oxides of nitrogen data.

National Park Unit	Site Name	Highest Daily Maximum 1-Hour Average Concentrations (ppb)				
		1st Highest	2nd Highest	3rd Highest	4th Highest	No. of Days with 1-Hour Average >100 ppb
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)						
Chaco Culture	Radio Repeater	7.7	5.2	5.0	4.8	0
Great Smoky Mountains	Look Rock Ncore (NO_Y)	11.4	11.2	10.6	8.6	0
Mammoth Cave	Houchin Meadow (NO_Y)	21.7	21.0	15.0	13.2	0
Yellowstone	Old Faithful Snow Lodge	80.1	71.0	50.9	46.4	0
Yellowstone	West Yellowstone	126.7	99.5	88.6	86.3	1
Sites operated by the NPS for the Bureau of Land Management						
Rangely	Golf Course	44.2	32.2	29.5	28.6	0
Sites operated by cooperating state agencies						
Acadia	McFarland Hill (NO_Y)	7.2	5.3	5.2	4.4	0
Operating agency key:	plain text = site operated by the National Park Service *italics* = site operated by a state agency					

Table 9. 2021 Summary of $PM_{2.5}$ data from reference and equivalency methods.

National Park Unit	Site Name	Sampler Type*	% Valid	Annual Arithmetic Mean[a] (µg/m^3)	Highest Daily Maximum 24-Hour Average Concentrations[b] (µg/m^3) 1st Highest	2nd Highest	3rd Highest	4th Highest	98th Percentile Value	No. of Days with 24-Hour Average >35 µg/m^3
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)										
Great Smoky Mountains	Look Rock NCore	TEOM	99.3	7.7	32.5	25.5	24.9	23.3	21.4	0
Hawaii Volcanoes	Visitor Center	BAM	60.4	1.2	9.6	9.3	8.8	8.6	5.2	0
Joshua Tree	Cottonwood Visitor Center	BAM	92.5	4.6	17.2	11.7	11.5	11.0	11.0	0
Sequoia and Kings Canyon	Ash Mountain	BAM	91.0	12.0	556.7	195.8	86.0	85.3	**66.1**	17
Yellowstone	Old Faithful Snow Lodge	BAM	90.1	4.7	47.5	46.3	42.7	40.8	**36.0**	8
Yellowstone	West Yellowstone	BAM	94.2	5.2	51.3	50.7	45.9	44.0	33.8	5
Sites operated by the NPS for the Bureau of Land Management										
Rangely	Golf Course	BAM	99.4	9.2	62.4	51.3	45.4	43.4	25.5	4
Sites operated by cooperating state agencies										
Acadia	McFarland Hill	BAM	95.6	2.7	24.5	20.5	20.3	17.9	14.6	0
Badlands	Visitor Center	BAM	97.8	5.5	157.5	59.4	34.7	31.6	21.9	2
Indiana Dunes	Ammunition Bunker	BAM	96.5	8.5	89.6	33.3	26.9	25.5	23.5	1
Theodore Roosevelt	Painted Canyon Visitor Ctr	TEOM	98.4	5.0	61.7	53.1	41.2	37.1	27.2	4
Wind Cave	Visitor Center	BAM	97.5	4.0	133.8	44.7	37.1	24.9	21.8	3

[a] The primary annual National Ambient Air Quality Standard for $PM_{2.5}$ is an annual arithmetic mean of 15.0 µg/m^3. (An exceedance of the standard occurs when an annual arithmetic mean of $PM_{2.5}$ concentrations is greater than 15.0 µg/m^3. A violation of the standard occurs when the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations is greater than 15.0 µg/m^3.) (40 CFR 50.7.)

[b] The primary daily National Ambient Air Quality Standard for $PM_{2.5}$ is a 24-hour average concentration of 35 µg/m^3. (An exceedance of the standard occurs when a 24-hour average $PM_{2.5}$ concentration is greater than 35 µg/m^3. A violation of the standard occurs when the 3-year average of the annual 98th percentile of 24-hour $PM_{2.5}$ concentrations is greater than 35 µg/m^3.) (40 CFR 50.7.)

* TEOM = tapered element oscillating microbalance
BAM = beta attenuation monitor

Operating agency key: plain text = site operated by the National Park Service
italics = site operated by a state agency

Color shading key: Annual arithmetic mean **Red** >15 µg/m^3
98th percentile value **Red** >35 µg/m^3

Table 10. 2021 Summary of PM_{10} data from reference and equivalency methods.

National Park Unit	Site Name	Sampler Type*	% Valid	Annual Arithmetic Mean[a] (µg/m^3)	Highest Daily Maximum 24-Hour Average Concentrations[b] (µg/m^3)				
					1st Highest	2nd Highest	3rd Highest	4th Highest	No. of Days with 24-Hour Average >150 µg/m^3
Sites operated by cooperating state agencies									
Badlands	Visitor Center	BAM	98.7	14	190	80	50	50	1
Wind Cave	Visitor Center	BAM	94.5	11	160	60	60	40	1
Yosemite	Village	BAM	94.3	17	80	80	70	70	0

[a] The primary and annual National Ambient Air Quality Standard for PM_{10} is an annual arithmetic mean of 50 µg/m^3. (An exceedance of the standard occurs when an annual arithmetic mean of PM_{10} concentrations is greater than 50 µg/m^3. A violation of the standard occurs when the 3-year average of the weighted annual mean PM_{10} concentrations is greater than 50 µg/m^3.) (40 CFR 50.6.)

[b] The primary daily National Ambient Air Quality Standard for PM_{10} is a 24-hour average concentration of 150 µg/m^3. (An exeedance of the standard occurs when a 24-hour average PM_{10} concentration is greater than 150 µg/m^3. A violation of the standard occurs when a 24-hour average concentration greater than 150µg/m^3 occurs more than once in a calendar year.) (40 CFR 50.6.)

* TEOM = tapered element oscillating microbalance
BAM = beta attenuation monitor

Operating agency key: *italics* = site operated by a state agency

Color shading key: **Red** >50 µg/m^3 annual arithmetic mean, > 150 µg/m^3 24-hour average

Table 11. 2021 PM_{10} summary - maximum daily 24-hour average concentration in 2019-2021 ($\mu g/m^3$)[a].

National Park Unit	Site Name	Sampler Type*	2021	2020	2019
Sites operated by cooperating state agencies					
Badlands	Visitor Center	BAM	190	50	30
Wind Cave	Visitor Center	BAM	160	70	30
Yosemite	Village	BAM	80	720	130

[a] The primary daily National Ambient Air Quality Standard for PM_{10} is a 24-hour average concentration of 150 $\mu g/m^3$. (An exeedance of the standard occurs when a 24-hour average PM_{10} concentration is greater than 150 $\mu g/m^3$. A violation of the standard occurs when a 24-hour average concentration greater than 150 $\mu g/m^3$ occurs more than once per year on average over 3 years.) (40 CFR 50.6.)

* TEOM = tapered element oscillating microbalance
BAM = beta attenuation monitor

Operating agency key*: italics* = site operated by a state agency

Color shading key: **Red** = more than one 24-hour average concentration > 150 $\mu g/m^3$

Table 12. 2021 Annual summary of selected meteorological data.

		Wind Speed (m/s)	Ambient Temperature (degrees C)			Relative Humidity (%)			Precipitation (mm)
National Park Unit	Site Name	Average	Average	Maximum	Minimum	Average	Maximum	Minimum	Annual Accumulation
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)									
Big Bend	K-Bar Ranch Road	3.5	21.0	40.7	-11.6	42	95	4	155.2
Canyonlands	Island in the Sky	2.9	13.0	39.2	-8.5	39	99	1	264.5
Carlsbad Caverns	Biology Building	4.8	18.4	39.9	-16.0	41	99	3	377.6
Chaco Culture	Radio Repeater	4.1	11.8	37.3	-15.7	41	100	4	150.5
Chiricahua	Entrance Station	3.0	16.4	39.1	-7.0	38	94	3	388.2
Craters of the Moon	Visitor Center	3.2	7.7	35.4	-16.9	---	---	---	---
Death Valley	Park Village	4.1	26.9	50.9	4.9	---	---	---	---
Denali	Headquarters	1.4	-2.5	26.8	-35.3	71	97	13	546.8
Dinosaur	West Entrance Housing	1.5	10.4	40.4	-21.2	---	---	---	270.0
Everglades	Beard Center	2.9	24.2	34.6	7.7	78	100	23	1,201.4
Glacier	West Glacier Horse Stables	0.8	6.0	35.4	-31.3	---	---	---	---
Grand Canyon	The Abyss	2.9	11.9	35.8	-9.8	40	95	3	193.3
Grand Teton	Science School	2.6	5.0	31.9	-24.5	64	98	11	286.1
Great Basin	Maintenance Yard	2.7	10.2	36.5	-13.8	40	94	2	282.1
Great Smoky Mountains	Cades Cove	1.1	14.1	34.1	-6.0	77	100	10	1,586.2
Great Smoky Mountains	Clingmans Dome	2.1	11.8	22.6	-3.3	88	100	2	1,390.7
Great Smoky Mountains	Cove Mountain	4.2	11.6	26.1	-12.3	72	100	0	1,190.3
Great Smoky Mountains	Look Rock	2.1	13.5	28.9	-9.8	72	100	12	1,601.9
Hawaii Volcanoes	Visitor Center	3.5	15.2	25.3	7.9	90	100	37	1,948.9
Joshua Tree	Black Rock	4.0	16.9	39.6	-4.0	34	95	4	169.8
Joshua Tree	Cottonwood Visitor Center	2.7	19.6	41.6	-1.1	30	98	6	59.0
Lassen Volcanic	Manzanita Lake Fire Station	1.1	8.2	33.1	-16.5	59	99	9	854.9
Mammoth Cave	Houchin Meadow	1.6	14.3	34.1	-14.6	75	100	20	1,522.0
Mesa Verde	Resource Management Area	3.0	10.7	34.4	-14.8	41	97	2	338.5
Petrified Forest	South Entrance	4.1	13.8	38.7	-12.5	---	---	---	---
Pinnacles	SW of East Entrance Station	2.1	14.5	43.8	-5.9	60	100	7	345.6
Rocky Mountain	Longs Peak	2.4	4.8	28.0	-28.5	50	100	4	483.5
Sequoia and Kings Canyon	Ash Mountain	2.5	18.1	42.1	-0.6	47	96	8	397.6
Sequoia and Kings Canyon	Lower Kaweah	1.8	16.2	30.9	-1.9	45	100	8	50.6
Shenandoah	Big Meadows	1.6	9.2	28.3	-14.4	73	100	8	1,164.9
Voyageurs	Sullivan Bay	2.3	6.0	36.6	-35.8	71	100	15	472.3
Yellowstone	Old Faithful Snow Lodge	1.7	1.7	28.6	-29.3	66	100	11	---
Yellowstone	Water Tank	1.6	1.9	29.9	-23.4	65	97	7	453.1
Yellowstone	West Entrance	1.1	3.2	31.7	-31.9	67	99	10	---
Yosemite	Turtleback Dome	4.1	12.9	34.2	-8.6	42	99	4	530.2
Zion	Dalton's Wash	4.1	17.7	45.6	-4.9	---	---	---	203.9
Sites operated by the NPS for the Bureau of Land Management									
Rangely	Golf Course	3.1	9.9	38.9	-21.2	49	100	4	291.0

Table 12. 2021 Annual summary of selected meteorological data (continued).

		Wind Speed (m/s)	Ambient Temperature (degrees C)			Relative Humidity (%)			Precipitation (mm)
National Park Unit	Site Name	Average	Average	Maximum	Minimum	Average	Maximum	Minimum	Annual Accumulation
Sites operated by cooperating state agencies									
Acadia	Cadillac Mountain	6.1	11.0	33.8	-16.3	89	100	22	---
Acadia	McFarland Hill	2.3	8.4	32.0	-17.3	77	100	22	1,304.7
Cape Cod	Cape Cod	2.4	11.6	36.9	-11.2	73	100	18	---
Chamizal	Chamizal	3.1	20.0	40.7	-9.1	33	97	4	---
Indiana Dunes	Ammunition Bunker	2.8	11.5	35.7	-19.8	75	100	19	---
Saguaro	East	---	21.0	43.4	-0.5	32	99	2	---
Theodore Roosevelt	Painted Canyon, VC	5.2	8.3	37.9	-32.5	57	95	7	290.7
Wind Cave	Visitor Center	2.8	14.2	38.1	-20.3	53	100	7	425.3
Portable ozone monitoring systems (POMS)									
Guadalupe Mountains	Maintenance Area	3.7	22.3	37.0	6.6	48	98	8	493.7
Joshua Tree	Pinto Wells	3.6	23.8	47.9	1.6	23	93	4	12.2

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

Operating agency key: plain text = site operated by the National Park Service
italics = site operated by a state agency
underline = site oprated by the National Park Service, but consisting of non-EPA certified portable instrumentation