

Table 1. 2022 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	33	---	---	---	---	X	X	X	X	X	X
Canyonlands	Island in the Sky	UT	CANY-IS	CAN407	49-037-0101	38.4583	109.8214	1794	31	---	---	---	---	X	X	X	X	X	X
Carlsbad Caverns	Biology Building	NM	CAVE-BB	---	35-015-0010	32.1783	104.4406	1357	4	---	---	---	---	X	X	X	X	X	---
Chaco Culture	Radio Repeater	NM	CHCU-RR	CHC432	35-045-0020	36.0350	107.9042	1965	6	---	---	X	---	X	X	X	X	X	---
Chiricahua	Entrance Station	AZ	CHIR-ES	CHA467	04-003-8001	32.0094	109.3892	1569	32	---	---	---	---	X	X	X	X	X	X
Craters of the Moon	Visitor Center	ID	CRMO-VC	CRM435	16-023-0101	43.4606	113.5622	1815	31	---	---	---	---	X	X	---	---	X	---
Death Valley	Park Village	CA	DEVA-PV	DEV412	06-027-0101	36.5092	116.8481	125	30	---	---	---	---	X	X	---	---	---	---
Denali	Headquarters	AK	DENA-HQ	DEN417	02-068-0003	63.7233	148.9675	663	36	---	---	---	---	X	X	X	X	X	X
Dinosaur	West Entrance Housing	UT	DINO-WE	DIN431	49-047-1002	40.4372	109.3047	1463	22	---	---	---	---	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	31	---	---	---	---	X	X	---	---	X	X
Grand Canyon	The Abyss	AZ	GRCA-AS	GRC474	04-005-8001	36.0586	112.1836	2073	30	---	---	---	---	X	X	X	X	X	X
Grand Teton	Science School	WY	GRTE-SS	GRT434	56-039-0008	43.6708	110.5994	2105	12	---	---	---	---	X	X	X	X	X	---
Great Basin	Maintenance Yard	NV	GRBA-MY	GRB411	32-033-0101	39.0050	114.2158	2058	30	---	---	---	---	X	X	X	X	X	X
Great Smoky Mountains	Cades Cove	TN	GRSM-CC	---	47-009-0102	35.6042	83.7831	564	30	---	---	---	---	X	X	X	X	X	---
Great Smoky Mountains	Clingmans Dome	TN	GRSM-CD	---	47-155-0102	35.5619	83.4981	2021	30	---	---	---	---	X	X	X	X	X	---
Great Smoky Mountains	Cove Mountain	TN	GRSM-CM	---	47-155-0101	35.6967	83.6086	1243	35	---	---	---	---	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	35	---	---	---	X	X	X	X	X	X	X
<u>Guadalupe Mountains</u>	Maintenance Area	TX	GUMO-MA	---	48-109-0002	31.8914	-104.8097	1701	4	---	---	---	---	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	30	---	---	---	---	X	X	X	X	X	X
Joshua Tree	Cottonwood Visitor Center	CA	JOTR-CV	---	06-065-0010	33.7472	115.8201	943	5	---	---	---	X	X	X	X	X	X	---
Lassen Volcanic	Manzanita Lake Fire Station	CA	LAVO-ML	LAV410	06-089-3003	40.5400	121.5764	1755	36	---	---	---	---	X	X	X	X	X	X
Mammoth Cave	Houchin Meadow	KY	MACA-HM	MAC426	21-061-0501	37.1317	86.1431	230	26	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	30	---	---	---	---	X	X	X	X	X	X
Petrified Forest	South Entrance	AZ	PEFO-SE	PET427	04-017-0119	34.8225	109.8950	1712	21	---	---	---	---	X	X	---	---	X	X

Table 1. 2022 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	36	---	---	---	---	X	X	X	X	X	X
Rocky Mountain	Longs Peak	CO	ROMO-LP	ROM406	08-069-0007	40.2710	105.5456	2742	39	---	---	---	---	X	X	X	X	X	X
Sequoia and Kings Canyon	Ash Mountain	CA	SEKI-AS	SEK430	06-107-0009	36.4894	118.8292	510	24	---	---	---	X	X	X	X	X	X	X
Sequoia and Kings Canyon	Lower Kaweah	CA	SEKI-LK	---	06-107-0006	36.5658	118.7772	1890	39	---	---	---	---	X	X	X	X	X	---
Shenandoah	Big Meadows	VA	SHEN-BM	SHN418	51-113-0003	38.5231	78.4347	1068	40	---	---	---	---	X	X	X	X	X	X
Voyageurs	Sullivan Bay	MN	VOYA-SB	VOY413	27-137-0034	48.4128	92.8292	427	27	---	---	---	---	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	27	---	---	---	---	X	X	X	X	X	X
Yosemite	Turtleback Dome	CA	YOSE-TD	YOS404	06-043-0003	37.7133	119.7061	1599	30	---	---	---	---	X	X	X	X	X	X
Zion	Dalton's Wash	UT	ZION-DW	ZIO433	49-053-0130	37.1983	113.1506	1213	19	---	---	---	---	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	13	---	---	X	X	X	X	X	X	X	---
Sites operated by cooperating state agencies																			
<i>Acadia</i>	Cadillac Mountain	ME	ACAD-CM	---	23-009-0102	44.3517	68.2269	466	28	---	---	---	---	X	X	X	---	---	---
<i>Acadia</i>	McFarland Hill	ME	ACAD-MH	ACA416	23-009-0103	44.3772	68.2608	153	25	X	X	X	X	X	X	X	X	X	X
<i>Badlands</i>	Visitor Center	SD	BADL-VC	---	46-071-1001	43.7436	101.9414	739	17	X	---	---	X	---	---	---	---	---	---
<i>Cape Cod</i>	Cape Cod	MA	CACO-XX	---	25-001-0002	41.9758	70.0247	41	36	---	---	---	---	X	X	X	---	X	---
<i>Chamizal</i>	Chamizal	TX	CHAM-XX	---	48-141-0044	31.7656	106.4550	1128	31	---	---	---	---	X	X	X	---	X	---
<i>Congaree</i>	Congaree Bluff	SC	COSW-BL	---	45-079-0021	33.8147	80.7811	34	23	---	---	---	---	---	---	---	---	---	---
<i>Everglades</i>	Cutler Road	FL	EVER-CR	---	12-086-0029	25.5861	80.3269	4	38	---	---	---	---	---	---	---	---	---	---
<i>Great Smoky Mountains</i>	Purchase Knob	NC	GRSM-PK	---	37-087-0036	35.5900	83.0775	1550	28	---	---	---	---	---	---	---	---	---	---
<i>Indiana Dunes</i>	Ammunition Bunker	IN	INDU-AB	---	18-089-0022	41.6067	87.3047	183	30	X	---	---	X	X	X	X	---	X	---

Table 1. 2022 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																			
<i>Mount Rainier</i>	Jackson Visitor's Center	WA	MORA-JV	---	53-053-0012	46.7853	121.7378	1615	25	---	---	---	---	---	---	---	---	---	---
<i>Saguaro</i>	East	AZ	SAGU-EA	---	04-019-0021	32.1744	110.7364	938	31	---	---	---	---	X	X	X	---	X	---
<i>Theodore Roosevelt</i>	Painted Canyon, VC	ND	THRO-VC	THR422	38-007-0002	46.8947	103.3778	840	25	X	---	---	X	X	X	X	X	X	X
<i>Wind Cave</i>	Visitor Center	SD	WICA-VC	WNC429	46-033-0132	43.5575	103.4839	1288	19	---	---	---	X	X	X	X	X	X	X
<i>Yosemite</i>	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 (SO₄²⁻), particulate nitrate (NO₃⁻), particulate ammonium (NH₄⁺), sulfur dioxide (SO₂), and nitric acid (HNO₃). In some cases, the positive ions Na⁺, K⁺, Ca²⁺, and Mg²⁺ 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: O₃ = ozone (ppb)

SO₂ = sulfur dioxide (ppb)

CO = carbon monoxide (ppm)

NO_x = oxides of nitrogen (ppb)

PM = particulate matter (µg/m³)

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/m²)

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

Table 2. 2022 Summary of 8-hour average ozone concentrations (ppb).

							# Days with 8-Hour Average O ₃ Values
National Park Unit	Site Name	Valid Number of Days	1st Highest	2nd Highest	3rd Highest	4th Highest	≥70 ppb ^a
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)							
Big Bend	K-Bar Ranch Road	326	66	66	64	64	0
Canyonlands	Island in the Sky	362	65	65	64	63	0
Carlsbad Caverns	Biology Building	347	86	85	84	83	21
Chaco Culture	Radio Repeater	349	74	66	65	65	1
Chiricahua	Entrance Station	360	71	66	65	65	1
Craters of the Moon	Visitor Center	364	62	60	60	60	0
Death Valley	Park Village	348	71	70	69	69	1
Denali	Headquarters	325	58	57	55	55	0
Dinosaur	West Entrance Housing	361	65	64	64	63	0
Glacier	West Glacier Horse Stables	349	53	53	52	52	0
Grand Canyon	The Abyss	350	65	64	64	62	0
Grand Teton	Science School	364	70	62	58	58	0
Great Basin	Maintenance Yard	336	64	64	61	61	0
Great Smoky Mountains	Cades Cove	262	66	64	63	63	0
Great Smoky Mountains	Clingmans Dome	192	64	64	63	63	0
Great Smoky Mountains	Cove Mountain	305	66	66	65	64	0
Great Smoky Mountains	Look Rock	345	75	69	68	68	1
Joshua Tree	Black Rock	357	83	83	83	80	37
Joshua Tree	Cottonwood Visitor Center	353	74	71	70	70	2
Lassen Volcanic	Manzanita Lake Fire Station	338	65	64	62	61	0
Mammoth Cave	Houchin Meadow	359	65	63	63	61	0
Mesa Verde	Resource Management Area	363	66	66	64	64	0
Petrified Forest	South Entrance	358	68	68	65	65	0
Pinnacles	SW of East Entrance Station	357	69	67	65	64	0
Rocky Mountain	Longs Peak	342	72	71	70	68	2
Sequoia and Kings Canyon	Ash Mountain	356	93	89	87	86	80
Sequoia and Kings Canyon	Lower Kaweah	194	84	78	77	77	40
Shenandoah	Big Meadows	350	67	62	61	61	0
Voyageurs	Sullivan Bay	350	57	54	53	52	0
Yellowstone	Water Tank	358	63	61	56	55	0
Yosemite	Turtleback Dome	364	81	70	70	69	1
Zion	Dalton's Wash	359	69	65	64	64	0
Sites operated by the NPS for the Bureau of Land Management							
Rangely	Golf Course	351	64	63	62	62	0
Sites operated by cooperating state agencies							
Acadia	Cadillac Mountain	204	74	68	66	66	1
Acadia	McFarland Hill	351	70	69	65	65	0
Badlands	Visitor Center	356	69	66	66	65	0
Cape Cod	Cape Cod	356	68	65	62	60	0
Chamizal	Chamizal	347	75	73	71	68	3
Congaree	Congaree Bluff	243	60	59	59	58	0
Everglades	Cutler Road	345	69	67	65	65	0

Table 2. 2022 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							
<i>Great Smoky Mountains</i>	Purchase Knob	238	73	65	65	64	1
<i>Indiana Dunes</i>	Ammunition Bunker	346	83	81	73	71	4
<i>Mount Rainier</i>	Jackson Visitor's Center	334	67	63	60	60	0
<i>Saguaro</i>	East	356	72	71	70	69	2
<i>Theodore Roosevelt</i>	Painted Canyon, VC	356	56	55	53	53	0
<i>Wind Cave</i>	Visitor Center	351	68	64	63	63	0
Portable ozone monitoring systems (POMS)^b							
<u>Guadalupe Mountains</u>	Maintenance Area	79	76	76	74	71	4

^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. 2022 Ozone violation summary - primary standard^{a,b}.

National Park Unit	Site Name	2020-2022	2019-2021	2018-2020	2017-2019	2016-2018	2015-2017	2014-2016
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)								
Big Bend	K-Bar Ranch Road	61	61	63	64	63	62	62
Canyonlands	Island in the Sky	66	66	66	65	65	64	64
Carlsbad Caverns	Biology Building	77	74	(73)	(74)	---	---	---
Chaco Culture	Radio Repeater	68	68	67	(65)	(66)	(64)	---
Chiricahua	Entrance Station	65	66	66	66	66	65	65
Craters of the Moon	Visitor Center	65	64	64	63	63	60	60
Death Valley	Park Village	72	72	73	72	(73)	(70)	70
Denali	Headquarters	53	52	52	52	50	50	53
Dinosaur	West Entrance Housing	64	67	66	70	72	72	68
Glacier	West Glacier Horse Stables	53	54	53	53	52	53	53
Grand Canyon	The Abyss	63	62	64	64	65	66	67
Grand Teton	Science School	61	61	59	59	60	59	59
Great Basin	Maintenance Yard	66	68	69	67	66	64	64
Great Smoky Mountains	Cades Cove	58	56	58	60	62	61	60
Great Smoky Mountains	Clingmans Dome	(60)	(60)	(62)	(62)	(63)	(63)	(65)
Great Smoky Mountains	Cove Mountain	61	60	62	64	67	67	68
Great Smoky Mountains	Look Rock	63	62	63	65	67	67	67
Joshua Tree	Black Rock	81	82	86	88	89	87	86
Joshua Tree	Cottonwood Visitor Center	68	(66)	(71)	(73)	(82)	---	---
Lassen Volcanic	Manzanita Lake Fire Station	68	67	68	66	68	64	65
Mammoth Cave	Houchin Meadow	59	59	59	61	63	64	64
Mesa Verde	Resource Management Area	66	66	68	67	68	66	65
Petrified Forest	South Entrance	66	66	67	66	65	63	64
Pinnacles	SW of East Entrance Station	67	66	65	64	68	68	69
Rocky Mountain	Longs Peak	72	71	70	68	70	68	69
Sequoia and Kings Canyon	Ash Mountain	91	90	88	86	89	89	89
Sequoia and Kings Canyon	Lower Kaweah	(83)	(82)	83	82	86	84	(84)
Shenandoah	Big Meadows	58	57	57	60	63	63	63
Voyageurs	Sullivan Bay	55	56	56	56	55	54	55
Yellowstone	Water Tank	62	64	63	62	62	61	60
Yosemite	Turtleback Dome	77	77	79	77	79	75	74
Zion	Dalton's Wash	66	65	66	66	66	65	(65)
Sites operated by the NPS for the Bureau of Land Management								
Rangely	Golf Course	65	66	65	65	64	63	63

Table 3. 2022 Ozone violation summary - primary standard^{a,b} (continued).

National Park Unit	Site Name	2020-2022	2019-2021	2018-2020	2017-2019	2016-2018	2015-2017	2014-2016
Sites operated by cooperating state agencies								
<i>Acadia</i>	Cadillac Mountain	67	67	65	69	70	71	66
<i>Acadia</i>	McFarland Hill	61	60	60	64	63	64	62
<i>Badlands</i>	Visitor Center	60	57	60	62	63	61	58
<i>Cape Cod</i>	Cape Cod	64	64	64	67	69	(69)	(65)
<i>Chamizal</i>	Chamizal	69	71	74	74	71	69	67
<i>Congaree</i>	Congaree Bluff	55	55	54	55	55	55	55
<i>Everglades</i>	Cutler Road	60	58	61	61	62	(61)	61
<i>Great Smoky Mountains</i>	Purchase Knob	62	61	62	63	64	64	65
<i>Indiana Dunes</i>	Ammunition Bunker	71	69	70	68	70	68	67
<i>Mount Rainier</i>	Jackson Visitor's Center	59	58	61	64	64	63	(59)
<i>Saguaro</i>	East	69	67	69	69	71	69	68
<i>Theodore Roosevelt</i>	Painted Canyon, VC	58	60	57	60	59	60	58
<i>Wind Cave</i>	Visitor Center	63	61	60	61	62	61	58

^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. 2022 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	93.2	3.5	June-August	5.6	March-May	6.5	March-May
Canyonlands	Island in the Sky	99.1	4.2	May-July	8.1	June-August	9.2	June-August
Carlsbad Caverns	Biology Building	97.7	28.8	May-July	20.4	June-August	21.7	June-August
Chaco Culture	Radio Repeater	96.2	8.5	May-July	9.9	May-July	11.0	May-July
Chiricahua	Entrance Station	98.7	12.6	May-July	11.4	May-July	12.5	May-July
Craters of the Moon	Visitor Center	96.8	1.3	July-September	5.8	July-September	6.7	July-September
Death Valley	Park Village	96.8	15.7	June-August	13.7	June-August	14.9	June-August
Denali	Headquarters	89.0	0.0	January-March	2.4	March-May	3.2	March-May
Dinosaur	West Entrance Housing	97.4	8.8	June-August	9.7	June-August	10.8	June-August
Glacier	West Glacier Horse Stables	96.3	0.1	July-September	1.2	March-May	1.9	March-May
Grand Canyon	The Abyss	96.7	7.9	May-July	8.9	May-July	10.0	May-July
Grand Teton	Science School	99.1	1.5	May-July	4.1	May-July	4.9	May-July
Great Basin	Maintenance Yard	92.4	4.0	June-August	8.1	June-August	9.0	June-August
Great Smoky Mountains	Cades Cove	97.2	1.9	March-May	3.4	March-May	4.1	March-May
Great Smoky Mountains	Clingmans Dome	61.0	1.5	May-July	2.3	May-July	3.0	May-July
Great Smoky Mountains	Cove Mountain	84.7	2.8	March-May	4.3	March-May	5.1	March-May
Great Smoky Mountains	Look Rock	94.5	3.2	June-August	4.3	March-May	5.1	March-May
Joshua Tree	Black Rock	98.0	33.9	May-July	24.1	May-July	25.4	May-July
Joshua Tree	Cottonwood Visitor Center	96.4	22.5	April-June	15.4	April-June	16.7	April-June
Lassen Volcanic	Manzanita Lake Fire Station	91.9	2.6	May-July	5.5	June-August	6.4	June-August
Mammoth Cave	Houchin Meadow	94.3	3.0	May-July	4.4	May-July	5.2	May-July
Mesa Verde	Resource Management Area	99.3	9.5	June-August	9.9	June-August	10.9	June-August
Petrified Forest	South Entrance	99.2	11.5	May-July	10.7	May-July	11.8	May-July
Pinnacles	SW of East Entrance Station	97.8	6.4	July-September	5.7	August-October	6.4	July-September
Rocky Mountain	Longs Peak	91.7	10.0	April-June	10.4	April-June	11.7	June-August
Sequoia and Kings Canyon	Ash Mountain	98.1	58.4	July-September	42.0	July-September	43.7	July-September
Sequoia and Kings Canyon	Lower Kaweah	92.6	41.5	July-September	27.6	July-September	32.2	June-August
Shenandoah	Big Meadows	97.6	1.9	April-June	4.0	April-June	4.8	April-June
Voyageurs	Sullivan Bay	96.3	0.0	April-June	1.4	March-May	2.1	March-May
Yellowstone	Water Tank	98.7	1.0	May-July	3.1	March-May	4.0	March-May
Yosemite	Turtleback Dome	99.5	16.0	July-September	12.6	July-September	13.8	July-September
Zion	Dalton's Wash	99.1	8.5	May-July	9.5	May-July	10.5	May-July
Sites operated by the NPS for the Bureau of Land Management								
Rangely	Golf Course	95.8	4.2	June-August	7.6	June-August	8.5	June-August
Sites operated by cooperating state agencies								
<i>Acadia</i>	Cadillac Mountain	98.9	3.1	June-August	2.8	May-July	3.4	May-July
<i>Acadia</i>	McFarland Hill	97.0	2.5	June-August	2.5	June-August	3.0	May-July
<i>Badlands</i>	Visitor Center	97.2	7.1	June-August	7.7	July-September	8.2	June-August
<i>Cape Cod</i>	Cape Cod	97.3	2.6	June-August	3.1	June-August	3.6	June-August
<i>Chamizal</i>	Chamizal	95.5	10.0	June-August	8.1	May-July	9.0	May-July
<i>Congaree</i>	Congaree Bluff	98.9	2.1	April-June	2.9	April-June	3.3	April-June
<i>Everglades</i>	Cutler Road	96.7	2.0	August-October	2.2	March-May	2.6	March-May
<i>Great Smoky Mountains</i>	Purchase Knob	94.1	5.2	March-May	6.3	March-May	6.8	March-May

Table 4. 2022 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
<i>Indiana Dunes</i>	Ammunition Bunker	96.5	9.5	May-July	7.8	May-July	8.6	May-July
<i>Mount Rainier</i>	Jackson Visitor's Center	96.9	1.6	June-August	2.6	July-September	3.1	July-September
<i>Saguaro</i>	East	97.2	13.9	June-August	11.4	June-August	13.3	May-July
<i>Theodore Roosevelt</i>	Painted Canyon, VC	97.2	0.1	May-July	2.2	June-August	2.7	June-August
<i>Wind Cave</i>	Visitor Center	96.8	7.1	July-September	8.1	July-September	8.6	July-September
Portable ozone monitoring systems (POMS)								
<u>Guadalupe Mountains</u>	Maintenance Area	93.2	21.4	May-July	14.8	May-July	16.0	May-July

^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. 2022 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)				
		1 st	2 nd	3 rd	4 th	99th	No. of Days with 1-Hr Average >75 ppb	1 st	2 nd	3 rd	4 th	No. of Days with 3-Hr Maximum >549 ppb
		Highest	Highest	Highest	Highest	Percentile Value		Highest	Highest	Highest	Highest	
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)												
Great Smoky Mountains	Look Rock NCore	1.1	0.8	0.8	0.7	1	0	0.6	0.5	0.5	0.4	0
Hawaii Volcanoes *	Visitor Center	361.2	296.8	253.7	243.1	243	15	205.8	191.6	186.6	155.8	0
Mammoth Cave	Houchin Meadow	3.2	3.1	2.1	1.9	2	0	2.2	2.0	1.6	1.5	0
Sites operated by cooperating state agencies												
Acadia	McFarland Hill	0.8	0.7	0.7	0.6	1	0	0.6	0.5	0.5	0.5	0
Badlands	Visitor Center	1.4	1.3	1.2	1.2	1	0	1.1	1.0	1.0	0.9	0
Indiana Dunes	Ammunition Bunker	27.4	23.3	22.0	20.4	20	0	18.8	18.7	16.0	14.4	0
Theodore Roosevelt	Painted Canyon, VC	9.9	5.2	5.2	5.2	5	0	6.1	5.9	5.0	4.8	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 µg/m³ 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. 2022 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)				
		1 st	2 nd	3 rd	4 th	No. of Days with 1-Hr Average >35 ppm	1 st	2 nd	3 rd	4 th	No. of Days with 8-Hr Average >9 ppm
		Highest	Highest	Highest	Highest		Highest	Highest	Highest	Highest	
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)											
Great Smoky Mountains	Look Rock NCore	0.524	0.314	0.266	0.256	0	0.228	0.228	0.223	0.201	0
Mammoth Cave	Houchin Meadow	0.395	0.304	0.294	0.287	0	0.284	0.271	0.261	0.251	0
Yellowstone	Old Faithful Snow Lodge	0.616	0.538	0.482	0.383	0	0.364	0.309	0.298	0.223	0
Yellowstone	West Yellowstone	3.314	2.611	2.213	1.965	0	0.673	0.610	0.563	0.502	0

Sites operated by cooperating state agencies

<i>Acadia</i>	McFarland Hill	0.340	0.307	0.256	0.255	0	0.266	0.254	0.234	0.231	0
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^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. 2022 Summary of nitrogen dioxide data.

		Highest Daily Maximum 1-Hour Average Concentrations ^{ab} (ppb)						
		1st Highest	2nd Highest	3rd Highest	4th Highest	98 th Percentile Value	No. of Days with 1-Hour Average >100 ppb	Annual Arithmetic Mean
National Park Unit	Site Name							
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)								
Chaco Culture	Radio Repeater	5.2	5.1	4.9	4.3	4	0	1
Great Smoky Mountains	Look Rock NCore	9.7	9.2	8.3	8.1	7	0	2
Mammoth Cave	Houchin Meadow	19.1	18.1	17.1	14.9	13	0	2
Yellowstone	Old Faithful Snow Lodge	23.8	22.1	19.2	15.4	12	0	1
Yellowstone	West Yellowstone	34.1	29.5	27.4	26.9	25	0	2
Sites operated by the NPS for the Bureau of Land Management								
Rangely	Golf Course	17.2	16.8	14.8	14.5	14	0	1

^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 NO₂ 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. 2022 Summary of oxides of nitrogen data.

		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
National Park Unit	Site Name					
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)						
Chaco Culture	Radio Repeater	5.6	5.2	5.1	5.0	0
Great Smoky Mountains	Look Rock Ncore (NO _y)	9.6	9.2	8.5	8.3	0
Mammoth Cave	Houchin Meadow (NO _y)	19.1	18.1	17.1	15.0	0
Yellowstone	Old Faithful Snow Lodge	57.3	41.4	37.6	36.6	0
Yellowstone	West Yellowstone	130.3	112.0	108.6	106.0	5
Sites operated by the NPS for the Bureau of Land Management						
Rangely	Golf Course	18.6	18.2	17.2	15.6	0
Sites operated by cooperating state agencies						
Acadia	McFarland Hill (NO _y)	82.7	26.0	16.5	14.7	0
Operating agency key:	plain text = site operated by the National Park Service <i>italics</i> = site operated by a state agency					

Table 9. 2022 Summary of PM_{2.5} data from reference and equivalency methods.

					Highest Daily Maximum 24-Hour Average Concentrations ^b (µg/m ³)					
				Annual Arithmetic Mean ^a (µg/m ³)	1st Highest	2nd Highest	3rd Highest	4th Highest	98 th Percentile Value	No. of Days with 24-Hour Average >35 µg/m ³
National Park Unit	Site Name	Sampler Type*	% Valid							
Sites operated by the National Park Service (Gaseous Pollutant Monitoring Program)										
Great Smoky Mountains	Look Rock NCore	TEOM	95.2	6.7	21.4	19.7	16.9	14.9	13.6	0
Hawaii Volcanoes	Visitor Center	BAM	91.9	1.7	15.5	14.0	13.6	11.1	9.0	0
Sequoia and Kings Canyon	Ash Mountain	BAM	96.8	6.0	23.9	21.2	20.1	19.5	16.6	0
Yellowstone	Old Faithful Snow Lodge	BAM	93.2	3.5	25.4	20.8	18.1	17.2	12.1	0
Yellowstone	West Yellowstone	BAM	92.4	3.0	37.2	22.4	19.5	18.6	15.3	1
Sites operated by the NPS for the Bureau of Land Management										
Rangely	Golf Course	BAM	90.5	6.7	18.0	16.3	16.3	15.2	14.2	0
Sites operated by cooperating state agencies										
Acadia	McFarland Hill	BAM	97.5	2.7	15.3	14.4	13.7	13.3	11.7	0
Badlands	Visitor Center	BAM	99.1	3.0	24.4	21.4	18.5	18.0	14.7	0
Indiana Dunes	Ammunition Bunker	BAM	93.6	7.0	33.4	25.6	24.4	24.2	20.1	0
Theodore Roosevelt	Painted Canyon Visitor Ctr	TEOM	97.5	5.0	24.0	22.7	21.3	20.5	13.1	0
Wind Cave	Visitor Center	BAM	96.6	3.7	43.7	24.0	23.1	20.1	15.5	1

^a The primary annual National Ambient Air Quality Standard for PM_{2.5} is an annual arithmetic mean of 15.0 µg/m³. (An exceedance of the standard occurs when an annual arithmetic mean of PM_{2.5} concentrations is greater than 15.0 µg/m³. 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/m³.) (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/m³. (An exceedance of the standard occurs when a 24-hour average PM_{2.5} concentration is greater than 35 µg/m³. 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/m³.) (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/m³
98th percentile value **Red** >35 µg/m³

Table 10. 2022 Summary of PM₁₀ data from reference and equivalency methods.

					Highest Daily Maximum 24-Hour Average Concentrations ^b (µg/m ³)				
National Park Unit	Site Name	Sampler Type*	% Valid	Annual Arithmetic	1st Highest	2nd Highest	3rd Highest	4th Highest	No. of Days with 24-Hour Average >150 µg/m ³
				Mean ^a (µg/m ³)					
Sites operated by cooperating state agencies									
Badlands	Visitor Center	BAM	98.8	12	60	50	50	40	0
Wind Cave	Visitor Center	BAM	96.9	6	60	40	40	40	0
Yosemite	Village	BAM	98.0	24	160	140	140	140	1

^a The primary and annual National Ambient Air Quality Standard for PM₁₀ is an annual arithmetic mean of 50 µg/m³. (An exceedance of the standard occurs when an annual arithmetic mean of PM₁₀ concentrations is greater than 50 µg/m³. A violation of the standard occurs when the 3-year average of the weighted annual mean PM₁₀ concentrations is greater than 50 µg/m³.) (40 CFR 50.6.)

^b The primary daily National Ambient Air Quality Standard for PM₁₀ is a 24-hour average concentration of 150 µg/m³. (An exceedance of the standard occurs when a 24-hour average PM₁₀ concentration is greater than 150 µg/m³. A violation of the standard occurs when a 24-hour average concentration greater than 150 µg/m³ 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/m³ annual arithmetic mean, > 150 µg/m³ 24-hour average

Table 11. 2022 PM₁₀ summary - maximum daily 24-hour average concentration in 2020-2022 (µg/m³)^a.

National Park Unit	Site Name	Sampler Type*	2022	2021	2020
Sites operated by cooperating state agencies					
<i>Badlands</i>	Visitor Center	BAM	60	190	50
<i>Wind Cave</i>	Visitor Center	BAM	60	160	70
<i>Yosemite</i>	Village	BAM	160	80	720

^a The primary daily National Ambient Air Quality Standard for PM₁₀ is a 24-hour average concentration of 150 µg/m³. (An exceedance of the standard occurs when a 24-hour average PM₁₀ concentration is greater than 150 µg/m³. A violation of the standard occurs when a 24-hour average concentration greater than 150 µg/m³ 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 µg/m³

Table 12. 2022 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	3.7	20.8	41.3	-10.2	39	100	2	61.4
Canyonlands	Island in the Sky	2.8	12.3	36.2	-12.0	39	100	3	68.4
Carlsbad Caverns	Biology Building	5.1	18.1	40.2	-13.3	39	100	2	93.0
Chaco Culture	Radio Repeater	4.0	11.0	35.8	-16.8	43	100	5	92.1
Chiricahua	Entrance Station	2.9	15.4	36.1	-7.9	43	95	3	473.2
Craters of the Moon	Visitor Center	3.0	5.8	34.6	-24.7	---	---	---	---
Death Valley	Park Village	3.2	26.9	48.7	5.1	---	---	---	---
Denali	Headquarters	1.3	-1.5	26.9	-35.1	72	98	16	310.2
Dinosaur	West Entrance Housing	1.6	9.9	37.5	-24.7	---	---	---	225.0
Everglades	Beard Center	3.1	24.0	33.4	3.3	78	99	26	958.0
Glacier	West Glacier Horse Stables	0.8	4.9	33.3	-36.7	---	---	---	---
Grand Canyon	The Abyss	2.8	11.6	32.8	-10.7	39	100	3	93.8
Grand Teton	Science School	2.5	-2.7	23.1	-31.5	68	99	12	158.5
Great Basin	Maintenance Yard	2.8	9.3	35.4	-19.5	40	96	5	97.2
Great Smoky Mountains	Cades Cove	1.3	13.4	32.7	-18.1	78	100	12	1,403.6
Great Smoky Mountains	Clingmans Dome	2.2	11.5	23.1	-10.9	86	100	2	1,206.1
Great Smoky Mountains	Cove Mountain	4.3	11.3	27.4	-23.9	71	100	0	615.5
Great Smoky Mountains	Look Rock	2.1	13.8	33.6	-19.7	70	100	16	1,212.9
Hawaii Volcanoes	Visitor Center	3.3	15.8	25.0	8.7	89	95	29	516.2
Joshua Tree	Black Rock	3.9	16.5	37.9	-5.7	36	98	4	17.3
Joshua Tree	Cottonwood Visitor Center	2.7	19.1	38.2	-2.4	31	99	4	151.1
Lassen Volcanic	Manzanita Lake Fire Station	1.0	7.3	34.2	-16.0	59	100	10	326.9
Mammoth Cave	Houchin Meadow	1.7	14.0	35.5	-20.8	70	99	19	918.2
Mesa Verde	Resource Management Area	3.0	10.1	33.3	-14.5	43	95	5	145.4
Petrified Forest	South Entrance	4.2	13.1	37.1	-12.5	---	---	---	---
Pinnacles	SW of East Entrance Station	2.2	14.8	45.2	-7.0	57	100	6	63.9
Rocky Mountain	Longs Peak	2.5	4.3	26.8	-28.0	49	95	4	274.6
Sequoia and Kings Canyon	Ash Mountain	2.0	18.3	43.2	-1.8	47	100	7	87.2
Sequoia and Kings Canyon	Lower Kaweah	2.0	15.3	30.5	-7.7	47	95	6	56.5
Shenandoah	Big Meadows	1.6	8.9	27.3	-22.9	74	95	15	779.3
Voyageurs	Sullivan Bay	2.4	2.8	35.7	-34.7	75	100	16	418.2
Yellowstone	Old Faithful Snow Lodge	1.6	1.1	29.4	-39.8	68	100	10	---
Yellowstone	Water Tank	1.6	0.6	27.5	-32.7	68	99	10	333.7
Yellowstone	West Entrance	1.0	1.5	30.9	-38.1	68	99	9	---
Yosemite	Turtleback Dome	4.2	12.7	34.7	-7.6	44	100	8	155.7
Zion	Dalton's Wash	4.1	17.0	43.4	-9.2	---	---	---	74.7
Sites operated by the NPS for the Bureau of Land Management									
Rangely	Golf Course	3.0	8.5	36.6	-24.6	52	98	6	250.1

Table 12. 2022 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	6.0	11.9	33.1	-19.6	75	100	20	---
Acadia	McFarland Hill	2.4	8.4	32.7	-21.0	74	99	16	1,358.9
Cape Cod	Cape Cod	2.7	11.5	35.9	-12.2	76	100	20	---
Chamizal	Chamizal	2.7	19.6	40.1	-7.1	34	96	1	---
Indiana Dunes	Ammunition Bunker	2.9	10.6	37.3	-22.6	74	100	21	---
Saguaro	East	---	20.8	41.1	-1.3	34	100	2	---
Theodore Roosevelt	Painted Canyon, VC	5.6	5.7	35.1	-29.1	64	95	18	314.3
Wind Cave	Visitor Center	2.8	10.2	41.7	-31.0	48	94	7	306.3
Portable ozone monitoring systems (POMS)									
Guadalupe Mountains	Maintenance Area	4.4	25.0	36.8	5.4	32	95	4	92.7

Note : Dashed lines represent 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 operated by the National Park Service, but consisting of non-EPA certified portable instrumentation