

# KNOWN AMBIENT AIR QUALITY IN NATIONAL PARKS

May 1985

## Introduction

Criteria pollutant monitoring conducted in national parks has shown that park units are not immune from the impacts of sulfur dioxide and ozone pollution. Elevated levels of these pollutants are not limited to parks adjacent to or near large urbanized areas. Although levels of sulfur dioxide are well within the primary and secondary National Ambient Air Quality Standards, ozone levels have exceeded or have equalled the National Ambient Air Quality Standards at various national parks. A brief synopsis of the NPS criteria pollutant monitoring program follows.

## Criteria Pollutant Monitoring

Criteria pollutant monitoring in national parks has evolved from a few isolated research projects funded primarily through universities to a growing network of stations coordinated by the Natural Resources Program. By the summer of 1985, the network will have expanded to include sulfur dioxide monitoring at 11 parks, ozone monitoring at 19 parks, and total suspended particulates at 16 parks. Additionally, nitrogen dioxide is monitored at two parks and hydrogen sulfide at one. Monitoring methods used in the collection of data are those listed under EPA's List of Recommended Reference and Equivalent Methods and the Quality Assurance Requirements of 40 CFR Part 58 have been or are currently being implemented at all locations. This will allow for the direct comparison of NPS-collected air quality data with that collected by EPA and state air pollution control agencies.

The criteria pollutant monitoring program is carried out through the use of park personnel, cooperative agreements with state agencies, and through the help of environmental consulting firms at an average cost of \$250,000 per year.

## Monitoring Results

The accompanying tables show that ozone levels at several parks have exceeded the NAAQS on numerous occasions whereas sulfur dioxide levels are below the standards. Violation of the standards are not limited to parks near large urbanized areas (Santa Monica Mountains NRA - Los Angeles; Indiana Dunes National Lakeshore - Chicago, Gary) but also occur at remote locations in the high Sierras (Sequoia/Kings Canyon National Park) and the northeast (Acadia National Park). Additionally, parks in the mid-Atlantic region such as Great Smoky Mountains and Shenandoah show levels equalling the NAAQS. Available data show a slight but statistically significant increase in ozone monthly means at Shenandoah.

Although sulfur dioxide levels are below the NAAQS at all parks where monitoring is conducted, levels as high as 48 percent of the secondary standard are being recorded at Olympic National Park. At Theodore Roosevelt National Park, the Park Service working in close cooperation with the North Dakota Department of Health have implemented control actions which have resulted in a 75 percent reduction in short-term (3 hour and 24 hour) ambient levels recorded at the park. At other parks, there are insufficient data to make an adequate assessment of air quality trends.

SULFUR DIOXIDE CONCENTRATIONS IN NATIONAL PARKS

1981 - 1984

(Values reported represent maximum 3-hourly and 24-hourly concentrations in parts per billion, ppb. Numbers in parenthesis are concentrations as percent of the respective NAAQS.)

	Olympic National Park	Theodore Roosevelt National Park	Indiana Dunes National Lakeshore	Shenandoah National Park	Congaree Swamp National Monument
Averaging Time					
	3hr 24hr Ann.	3hr 24hr Ann.	3hr 24hr Ann.	3hr 24hr Ann.	3hr 24hr Ann.
1981	--	--	132 62 9 (26)(44) (31)	--	75 13 1 (15) (9) (3)
1982	143 42 2 (29)(30) (6)	165 69 3 (33)(49) (10)	148 42 8 (30)(30) (27)	--	54 36 1 (11)(26) (3)
1983	90 23 3 (18)(16) (10)	83 16 1 (17)(12) (3)	158 61 7 (32)(44) (23)	152 30 5 (10)(21) (17)	39 17 1 (8)(12) (3)
1984	240 60 ** (48)(43)	35 16 2 (7)(12) (7)	110 39 ** (22)(28)	73* 25* ** (6)(18)	** ** *

NO

-- No data.

\* Preliminary data.

\*\* Data collected but not yet available.

National Ambient Air Quality Standard

3-hour Secondary Standard

24-hour Primary Standard

Annual Primary Standard

(NAAQS)

500 ppb

150 ppb

30 ppb

HIGHEST HOURLY OZONE CONCENTRATIONS IN NATIONAL PARKS

1982 - 1984 (Parts Per Billion, ppb)

National Ambient Air Quality Standard = 120 ppb

(Numbers in parentheses are the number of exceedances of the NAAQS)

Olympic National Park	Santa Monica Mountains Nat. Rec. Area*	Sequoia/Kings Canyon National Parks*	Grand Canyon National Park	Saguaro National Monument	Theodore Roosevelt National Park	Indiana Dunes National Lakeshore*	Shenandoah National Park	Gr. Smoky Mountains National Park	Congaree Swamp National Monumen*
<u>1982</u>									
60	--	150 (10)	--	60	--	--	--	110	60
<u>1983</u>									
50	--	120	66	110	80	--	120	--	120
<u>1984</u>									
60	220 (15)	**	**	**	70	155 (4)	115	**	**

NOTES: -- No data.

\* Parks exceeding ozone NAAQS.

\*\* Data collected but not available to NPS.

NATIONAL PARK SERVICE  
CRITERIA POLLUTANT AND VISIBILITY  
AIR QUALITY MONITORING

September 22, 1987

PARK	CAA	T	T*	N	C	FP	MET	SO2	O3	TSP	NO2	COMMENTS
Acadia NP	I	X	X <sup>+</sup>		X	I	X	X	X			TSP, State
Arches NP	I				X	I <sup>-</sup>	X	X	X			Transmissometer at Canyonlands NP
Badlands NP	I				X	I <sup>-</sup>	X	X	X			Operating by End of 1987
Bandelier NM	I				X	I <sup>-</sup>	X	X	X			Operating by End of 1987
Big Bend NP	I	X	X <sup>+</sup>		X	I						
Big Thicket NP	II							X	X			
Black Canyon of the Gunnison NM	I	X			X							BLM Funding
Bryce Canyon NP	I	X			X	I	X					
Buffalo N River	II				X							
Canyonlands NP	I	X	X		X	I						
Cape Cod NS	II								X			State 1987
Capitol Reef NP	I	X			X							
Capulin Mtn. NM	II	X			X							
Carlsbad Caverns NP	I				X							FP, SO2, O3 at Quad. Mtns. NP
Chaco Culture NHP	II	X			X							
Channel Islands NP	II							X	X		X	(County)
Chiricahua NM	I	X	X <sup>+</sup>		X	I						
Colorado NM	II				X		X	X	X	X		(State)
Congaree Swamp NM	II							X	X	X	X	(State)
Crater Lake NP	I	X		X	X	I						(State - T ; Park - N)
Craters of the Moon NM	I	X			X							
Cuyahoga Valley NRA	II							X	X			
Death Valley NM	II	X			X		X			X		
Denali NP	I				X	I	X	X	X			
Dinosaur NM	II	X			X							
Everglades NP	I				X		X	X	X			(State)
Glacier NP	I	X	X <sup>+</sup>		X	I			X			
Glen Canyon NRA	II	X										
Grand Canyon NP	I	X	X		X	I	X					
Grand Teton NP	I	X			X							
Great Sand Dunes NM	I		X <sup>+</sup>		X	I <sup>-</sup>	X	X	X			Operating by End of 1987
Great Smoky Mtns. NP	I			X	X	I	X		X	X		
Guadalupe Mtns. NP	I	X			X	I	X	X	X			
Haleakala NP	I				X	I <sup>-</sup>	X	X	X			Operating by End of 1987
Hawaii Volcanoes NP	I				X	I	X	X	X			H2S Also
Indiana Dunes NL	II							X	X	X		
Isle Royale NP	I				X	I <sup>-</sup>	X	X	X			

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PARK	CAA	T	T*	N	C	FP	MET	SO2	O3	TSP	NO2	COMMENTS
Joshua Tree NM	I	X			X				X			
Kings Canyon NP	I											Monitoring Conducted in Sequoia NP
Lake Mead NRA	II	X			X							
Lassen Volcanic NP	I				X	I <sup>-</sup>	X	X	X			Operating by End of 1987
Lava Beds NM	I	X			X							
Lehman Caves NM	II	X			X							
Mammoth Cave NP	I								X	X		(State)
Mesa Verde NP	I	X	X <sup>+</sup>		X	I						
Mount Rainier NP	I		X <sup>+</sup>		X	I						
Navajo NM	II				X							Camera to be Removed Summer 1987
North Cascades NP	I				X							
Olympic NP	I				X		X	X	X	X		(State)
Petrified Forest NP	I		X		X	I <sup>-</sup>	X	X	X			
Pinnacles NM	I		X <sup>+</sup>		X	I	X	X	X			
Point Reyes NS	I				X	I <sup>-</sup>	X	X	X			Operating by End of 1987
Redwood NP	I				X	I <sup>-</sup>	X	X	X			Operating by End of 1987
Rocky Mountain NP	I		X		X	I	X		X			
Saguaro NM	I					S	X	X	X			
Santa Monica Mtns. NRA	II								X			
Sequoia NP	I					S			X	X		(State) , FP Funded by ARB
Shenandoah NP	I	X	X <sup>+</sup>		X	I		X	X			
Theodore Roosevelt NP	I	X			X		X	X	X	X		(State) Also H2S
Virgin Islands NP	I											Monitoring Config. to be Est. Fall 1987
Voyageurs NP	I		X <sup>+</sup>		X	I	X	X	X			
Wind Cave NP	I	X			X							
Yellowstone NP	I		X <sup>+</sup>		X	I	X	X	X			
Yosemite NP	I	X			X	I <sup>-</sup>	X		X	X		
Zion NP	I				X							

KEY:

CAA = Clean Air Act Classification

N = Nephelometer

C = Camera (Automatic)

FP = Fine Particulate

MET = Meteorological Station

X<sup>+</sup> = Designated for transmissometer in 1987

T = All teloradiometers are being discontinued (Phased replacement with transmissometers began in 1987 )

T\* = Transmissometers to be added in FY87.

SO2 = Sulfur Dioxide

O3 = Ozone

TSP = Total Suspended Particulate

NO2 = Nitrogen Dioxide

I = Improve Particle Sampler (I<sup>-</sup> to be installed)

S = Stacked Filter Unit

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PARK	CAA	T <sup>0</sup>	T*	N	C	FP	MET	SO2	O3	TSP	NO2	COMMENTS
Acadia NP	I	X			X	X	X		X	X		TSP, State
Arches NP	I	X+			X	X	X	X	X			
Badlands NP	I											Monitoring Config. to be Est. Fall 1987
Bandelier NM	I											Monitoring Config. to be Est. Fall 1987
Big Bend NP	I	X			X	X						
Big Thicket NP	II							X	X			
Black Canyon of the Gunnison NM	I	X			X	X						BLM Funding
Bryce Canyon NP	I	X			X	X	X					
Buffalo N River	II				X							
Canyonlands NP	I	X			X	X						
Capitol Reef NP	I	X			X							
Capulin Mtn. NM	II	X			X							
Carlsbad Caverns NP	I	X+			X	X	X	X	X			
Chaco Culture NHP	II	X			X							
Channel Islands NP	II							X	X		X	(County)
Chiricahua NM	I	X			X	X						
Colorado NM	II				X		X	X	X	X		(State)
Congaree Swamp NM	II							X	X	X	X	(State)
Crater Lake NP	I	X		X	X	X						(State - T <sup>0</sup> ; Park - N)
Craters of the Moon NM	I	X			X							
Cuyahoga Valley NRA	II							X	X			
Death Valley NM	II	X			X		X			X		
Denali NP	I	X+			X	X	X	X	X			
Dinosaur NM	II	X			X							
Everglades NP	I				X		X	X	X			(State)
Glacier NP	I	X			X	X				X		
Glen Canyon NRA	II	X			X							
Grand Canyon NP	I	X			X	X	X					
Grand Teton NP	I	X			X							
Great Sand Dunes NM	I											Monitoring Config. to be Est. Fall 1987
Great Smoky Mtns. NP	I			X	X	X	X	X	X	X	X	
Guadalupe Mtns. NP	I	X			X							
Haleakala NP	I											Monitoring Config. to be Est. Fall 1987
Hawaii Volcanoes NP	I	X+			X	X	X	X	X			
Indiana Dunes NL	II							X	X	X		
Isle Royale NP	I	X+			X	X	X	X	X			Spring 1987

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Joshua Tree NM	I	X			X				X			
Kings Canyon NP	I											Monitoring Conducted in Sequoia NP
Lake Mead NRA	II	X			X							
Lassen Volcanic NP	I											Monitoring Config. to be Est. Fall 1987
Lava Beds NM	I	X			X							
Lehman Caves NM	II	X			X							
Mammoth Cave NP	I								X	X		(State)
Mesa Verde NP	I	X			X	X						
Mount Rainier NP	I				X	X						
Navajo NM	II				X							Camera to be Removed Summer 1987
North Cascades NP	I				X							
Olympic NP	I				X		X	X	X	X		(State)
Petrified Forest NP	I	X+			X	X	X	X	X			
Pinnacles NM	I	X+			X	X	X	X	X			
Point Reyes NS	I											Monitoring Config. to be Est. Fall 1987
Redwood NP	I											Monitoring Config. to be Est. Fall 1987
Rocky Mountain NP	I				X	X	X					
Saguaro NM	I					X	X	X	X			
Santa Monica Mtns. NRA	II								X			
Sequoia NP	I								X	X		(State)
Shenandoah NP	I	X			X	X		X	X			
Theodore Roosevelt NP	I	X			X		X	X	X	X		(State - SO2, O3, TSP)
Virgin Islands NP	I											Monitoring Config. to be Est. Fall 1987
Voyageurs NP	I	X+			X	X	X	X	X			
Wind Cave NP	I	X			X							
Yellowstone NP	I	X+			X	X	X	X	X			
Yosemite NP	I	X			X	X						
Zion NP	I				X							

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MET = Meteorological Station

X+ = Designated for transmissometer. No teleradiometer in place.

T<sup>o</sup> = All teleradiometers are being discontinued (Phased replacement with transmissometers will begin in 1987.)

T\* = Transmissometers to be added in FY87.

SO2 = Sulfur Dioxide

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TSP = Total Suspended Particulate

NO2 = Nitrogen Dioxide