March 2, 2001

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Memorandum

To: Regional GPRA Coordinators
Regional Air Quality Coordinators

From: David Joseph, Physical Scientist
Research and Monitoring Branch
Air Resources Division

Subject: GPRA Air Quality Goal Ia3 FY2000 Annual Performance Report

The Air Resources Division recently completed the FY2000 performance assessment for the GPRA Air Quality Goal Ia3, and I would like to provide a summary of it for your information.

The long-term Air Quality Goal Ia3 states that by September 30, 2005, air quality in 70 percent of reporting park areas has remained stable or improved. The planned FY2000 performance target was 55 percent of reporting park areas with stable or improved air quality by September 30, 2000. Our recent servicewide assessment for FY2000 indicated a performance measure of 59 percent, thus exceeding our target goal.

Performance Indicators

Three performance indicators (with five corresponding statistics) were used to determine the percent of parks showing improved or stable air quality: visibility, ozone, and acid precipitation. For visibility, particle measurements made at 29 NPS units were used to calculate the annual reconstructed atmospheric extinction for both clean and dirty days. (Extinction depends on the mass and chemical composition of the particles and is a quantitative measure of how the passage of light through the atmosphere is affected by air pollutants.) The annual daily maximum 1-hr ozone concentration averaged over the period May-September was calculated at 30 NPS units and used as the measure of ozone air quality. Finally, for acid precipitation, annual precipitation-weighted means of both sulfate and nitrate ion concentrations at 28 NPS sites were used to gauge air quality for this indicator.

To calculate a servicewide percentage to compare with the air quality goal, we first performed a trend analysis for each of the above five air quality measures (2 visibility, 1 ozone, 2 acid precipitation) over a ten year period. The FY2000 analysis used 1990-1999 data and required each site to have a minimum of at least six years of data in this ten-year period. (Year 2000 data were not used in this FY2000 analysis because all of that year's data were not available. There is typically a three to six month lag between the time the data are collected in the field and when they are validated and available for analysis.) Our trend time period is a sliding 10-year window and will change to 1991-2000 for next year's analysis. Computing trends during a sliding 10-year window was employed rather than tracking changes from a single fixed baseline year because each park often began its visibility, ozone, or acid precipitation monitoring during different years and there was no single fixed baseline year from which to track changes at all parks.

Trend Analysis Results

The results of the trend analyses for the five individual measures appear in Table 1. A park is considered to have improving or stable air quality if none of the five measures show a statistically significant degrading trend (denoted in table 1 with a red box). The tabulated values include the slope or change in the measure per year and a level of statistical significance (p-value). Slopes with p values at 0.15 or less are considered statistically significant.
The number of NPS areas not showing statistically significant deterioration in any of the performance indicators at the 0.15 level of significance is then divided by the total number of NPS units with monitoring to calculate a systemwide percentage which is then compared to the performance measure of the GPRA goal. For FY2000, 29 of 49 (59%) NPS parks with monitoring showed stable or improving trends.

Two fewer parks met the goal this year compared to last year's analysis. (The FY1999 analysis was based on 1989-98 data and 31 of 49 NPS parks with monitoring (63%) demonstrated stable or improving trends.) The specific parks meeting the air quality goal changed between the two analyses. Badlands National Park, Buffalo National River, Olympic National Park, Organ Pipe Cactus National Monument, and Theodore Roosevelt National Park did not meet the goal in FY1999 but did in FY2000. Bandelier National Monument, Craters of the Moon National Monument, Gila Cliff Dwellings National Monument, Great Basin National Park, Lassen Volcanic National Park, Mesa Verde National Park, and Tonto National Monument met the goal in FY1999 but did not in FY2000.

Figure 1 through Figure 6 present maps illustrating the results of the trend analyses for ozone, visibility and acid deposition. The solid green and red arrows represent statistically significant improving or degrading trends during 1990-1999, while the hollow green and red arrow symbols represent similar trends but statistically insignificant at the p=.15 level.

A statistically significant degrading trend in ozone was observed at several eastern sites-- Great Smoky Mountains National Park, Shenandoah National Park, Mammoth Cave National Park, Cowpens National Battlefield, and Voyageurs National Park. The FY2000 analysis dropped 1989 (a year with lower ozone concentrations) and added 1999 (a year with higher ozone concentrations) to the ten year trend analysis window. In the west, many sites in the Colorado Plateau and Rocky Mountains along with Lassen Volcanic and Denali National Parks showed increasing ozone air pollution trends, while levels at Pinnacles National Monument and Big Bend National Park showed improving ozone trends.

Many sites in the east and west demonstrated a statistically significant declining trend in sulfate ion concentrations in precipitation. Guadalupe Mountains had the only increasing trend of any NPS monitoring site. Spatial nitrate trends were not as prominent as sulfate. Several sites had improving trends (North Cascades National Park, Great Basin National Park, Sequoia National

Park) or degrading trends (Bandelier National Monument, Gila Cliff Dwellings National Monument, and Guadalupe Mountains National Park).

Eastern U.S. sites showed statistically significant improving visibility trends for clean days at Mammoth Cave National Park, Shenandoah National Park, Acadia National Park and Washington D.C. Washington D.C. also had an improving trend on dirty visibility days. Statistically significant improving trends for clean visibility days were observed at sites in the northwest U.S., Colorado Plateau, and Rocky Mountain areas. Sites in Arizona, New Mexico, and Texas documented degrading dirty day visibility trends. Improving clean day visibility trends were noted in the Pacific northwest, California (with the exception of Lassen Volcanic National Park) and Utah at Canyonlands National Park.

Improving Performance: Actions Being Taken to Meet Air Quality Goal

How can we make progress toward meeting the GPRA air quality goal when the National Park Service has no direct authority to control sources of pollution located outside park boundaries? Long-range transport of air pollution originating from distant sources is responsible for creating impacts on park units and existing air quality standards and regulations are not sufficient to fully protect park resources. What can be done to ensure that progress will continue to be made in meeting our long-term air quality goal? An important strategy for the Air Resources Division has been to actively promote and support national and regional initiatives to reduce air pollutant emissions. Such initiatives include:

Passenger Vehicle Standards

The NPS endorsed the Environmental Protection Agency's (EPA) issuance of "Tier 2" mobile source emission reduction standards and gasoline sulfur standards for refineries that would significantly reduce emissions from cars and light trucks, including sports utility vehicles, minivans, and pickup trucks. We submitted comments on the proposed rule, testified at a public hearing, and supported EPA during the OMB/interagency review process. Tier 2 will decrease emissions of hydrocarbons and nitrogen oxides, which will lead to reduced levels of ambient ozone, and will also decrease particulate matter and carbon monoxide emissions, improve visibility, address acid rain problems and reduce greenhouse gases and toxic air pollution. The new emissions standards, which were published in February 2000, will take effect in 2006 with the full effect on pollution levels expected by 2020. These standards will result in decreases in emissions even with expected increases in the number of vehicles and miles traveled.

Heavy Duty Diesel Engine and Vehicle Regulations

At many Class I areas and other park units near urban areas, visibility is affected by nitrogen based particles and elemental carbon particles. The large diesel engines of trucks and buses have been a major contributor to emissions of these pollutants and their precursors. The NPS submitted information from our air quality monitoring program to EPA and testified in favor of the proposed rule last summer. We also supported EPA during final interagency negotiations with OMB late last year. On February 28, 2001, new EPA Administrator Whitman decided to issue the final rule. The new standards, which need to be met by 2007, will substantially reduce the emissions of these pollutants. The technologies needed to achieve the expected reduction in oxides of nitrogen and fine particulate matter emissions from diesel engine require diesel fuel with very low sulfur content. EPA's rules require the sale of low-sulfur diesel as part of the overall strategy to reduce emissions. Reducing the sulfur content of diesel fuel would reduce emissions from the current fleet of heavy-duty vehicles, reduce sulfur dioxide and sulfate emissions from all new and old diesel vehicles, and potentially enable advanced low-emission and significantly more fuel-efficient vehicles.

Eastern States Nitrogen Oxides State Implementation Plan Order

In the eastern U.S., ground level ozone pollution routinely exceeds health standards. After a multi-year technical study of the effects of emissions of nitrogen oxides across the eastern region, EPA issued a requirement that 20 eastern states must reduce emissions of nitrogen oxides to levels determined to help bring the region into compliance with health standards. The NPS submitted information and comments in support of this rule. The rule was challenged in court, but upheld last year. Most of the emissions reductions needed to meet these plans would come from urban and rural electrical generation facilities by the application of retrofit technology. This reduction should lead to less formation of ozone and nitrate and, by reducing oxidants in the atmosphere, should lead to lower formation of sulfate as well. Both of these expected outcomes will provide additional contributions to meeting NPS GPRA visibility goals.

Regional Haze Regulations, Best Available Retrofit Technology Requirement, and Regional Planning Organizations

In 1999, the EPA completed regulations requiring States to make “reasonable progress” in returning visibility to “natural conditions” at “mandatory Federal Class I areas.” The mandatory Federal Class areas, as defined in the Clean Air Act, include all national park units over 6000 acres established by August 1977, plus any additions to those units. Because the program, by definition, is “regional” in nature, EPA noted that improving visibility in these areas would improve visibility nationally. Therefore, park units that are not Class I areas are also expected to benefit from this program.

One of the key components of the Regional Haze program is that older, major stationary sources, such as power plants, smelters, and oil refineries must install Best Available Retrofit Technology (BART) if they are found to contribute to regional haze. Since regional haze has been measured at all NPS locations that have monitors, and older sources emit more pollution than newer sources, the BART requirement is a major step in meeting the GPRA visibility goals. The NPS assisted EPA in developing a proposed rule outlining the BART process, and supported EPA during interagency deliberations. The proposed rule was signed in January 2001 but formal publication has been delayed pending review by the new Administration.

Multi-state regional planning organizations are coordinating planning efforts and will facilitate the implementation of the Regional Haze regulations. The ARD, with substantial assistance from park and regional air quality specialists, is actively participating in regional partnerships that have been formed for the Northeast (Ozone Transport Commission), Southeast (Southeastern States Air Resources Managers), Midwest (Lake Michigan Air Directors Consortium), Central States (Central States Regional Air Partnership), and the West (Western Regional Air Partnership). We have shared NPS monitoring data with these groups, explained how to analyze and interpret the data, and ensured that the NPS management objectives will be considered by securing a seat at the table.

Collaboration with Department of Justice (DOJ) in Support of Litigation Against Major Power Plants

In November 1999, the Department of Justice launched an enforcement initiative focusing on power plants in the East and Midwest and charging that modifications had been made at numerous facilities without the necessary new source review permits. Other companies have entered into negotiations to avoid litigation. These enforcement proceedings could produce very significant emission reductions at facilities that are contributing to air quality problems at eastern parks. In cooperation with the Solicitor's Office, the ARD has been providing information about air quality conditions, effects and trends in parks to DOJ for their use in these enforcement proceedings. We have agreed to make expert witnesses available, if needed. We communicate routinely with DOJ to ensure that NPS interests are protected.

New Source Review Improvement Rulemaking

Over the last two years ARD has worked with EPA to develop improvements to the New Source Review (NSR) program. NPS has striven to clarify the roles and responsibilities of the source owner, permitting authority, and NPS, and the time frames for reviews of permit applications for sources potentially affecting air quality near Class I areas. These changes, if implemented, would reduce delays and disputes associated with permit applications for sources near Class I areas because they would ensure that the NPS obtains the necessary information to conduct their permit reviews in a timely manner and provide a time frame for the NPS to identify any concerns and analyses needed for the permit applications. These and other new source review regulatory improvements await action by the new Administration.

In the meantime, we will continue to review applications for new sources for their impacts on Air Quality Related Values (AQRVs), determine if ambient air quality standards and increments are met, and ensure that the appropriate pollution control technology is proposed by the permit applicant. In cooperation with the Fish and Wildlife Service and Forest Service, we recently published a comprehensive guidance document that describes the federal land manager (FLM) role in the permitting process, identifies AQRVs, and explains assessment protocols. The Federal Land Manager Air Quality Related Values Work Group report (FLAG) is posted on our web site and has been distributed to every state air quality permitting agency.

Air Quality Related Value Restoration and Protection Rulemaking

In July of last year, the Department of the Interior asked the EPA for a rulemaking to restore and protect air quality related values in class I areas, and for more immediate actions to reverse deteriorating air quality trends at Great Smoky Mountains and Shenandoah National Parks and the Blue Ridge Parkway. In response to the EPA's August 2000 notice soliciting public comment on our rulemaking request, the NPS developed a technical support paper (available at www2.nature.nps.gov/ard/epa/index.htm) documenting that AQRVs are being adversely affected by air pollution at numerous national parks and wilderness areas. If EPA ultimately promulgates such a rule, the NPS will be better able to carry out its stewardship responsibilities because EPA will have provided Federal Land Managers and states with the regulatory tools they need to adequately protect AQRVs and mitigate adverse impacts. Presently, EPA is soliciting comments on our request until April 2, 2001.

These are some of the national and regional activities we are engaged in to make progress toward meeting the GPRA air quality goal. The information, expertise and management concerns that the NPS brings to various external decisionmaking arenas has made a difference. Air quality-related interpretive and educational programs implemented by parks have also contributed to public understanding and support for air pollution control programs. Efforts to reduce and prevent pollution from activities and operations within parks will also help us meet this goal. There certainly may be more things that can be done. Please contact us if you would like to discuss other actions that might be accomplished on a more local scale.

Table 1. Individual Park 1990-1999 Trend Results

Parks in RED do not meet NPS GPRA Air Quality goal	VISIBILITY				OZONE		ACID PRECIPITATION			
	Clean Days		*Dirty Days*		*Avg. Daily Max*		*Nitrate*		*Sulfate*	
Park	dv/yr	p-value	dv/yr	p-value	ppb/yr	p-value	ueq/liter/yr	p-value	ueq/liter/yr	p-value
Acadia	-0.23	0.02	-0.09	0.30	-0.11	0.50	-0.19	0.30	-0.72	0.05
Badlands	-0.12	0.05	0.14	0.24						
Bandelier	-0.18	0.05	0.18	0.11			0.60	0.06	-0.28	0.18
Big Bend	0.08	0.30	0.40	<0.01	-0.32	0.12	0.47	0.18	0.76	0.24
Bryce Canyon	-0.10	0.11	0.08	0.19			-0.04	0.50	-0.56	0.07
Buffalo National River							0.00	0.55	-0.56	0.14
Canyonlands	-0.15	0.04	-0.11	0.11	0.73	0.07				
Cape Cod					0.32	0.24				
Capulin Volcano							0.15	0.36	-0.26	0.11
Chamizal					0.94	0.23				
Chiricahua	0.08	0.15	0.05	0.43	0.17	0.31				
Congaree Swamp					1.66	0.24				
Cowpens					1.24	<0.01				
Crater Lake	-0.16	0.08	-0.03	0.43						
Craters of the Moon					1.34	0.12	-0.13	0.43	-0.70	<0.01
Denali	-0.07	0.24	-0.38	0.05	0.18	0.02	-0.07	0.24	-0.14	0.01
Everglades					0.29	0.36	-0.16	0.07	0.04	0.50
Gila Cliff Dwellings							0.72	0.01	-0.13	0.50
Glacier	-0.30	<0.01	-0.15	0.15	-0.20	0.43	-0.01	0.50	-0.22	0.02
Grand Canyon	0.02	0.30	0.17	0.11	1.07	<0.01	-0.11	0.36	-0.22	0.36
Great Basin	0.04	0.50	0.05	0.28	1.01	0.14	-0.46	0.14	-0.51	0.05
Great Sand Dunes	-0.21	0.08	0.08	0.30						
Great Smoky Mountains	0.08	0.24	0.09	0.19	1.87	<0.01	0.03	0.50	-0.91	0.05
Guadalupe Mountains	0.04	0.36	0.28	0.02			0.51	0.06	1.12	0.09
Indiana Dunes							0.25	0.30	-0.87	0.04
Isle Royale							0.08	0.30	-1.27	<0.01
Joshua Tree					0.04	0.46				
Lassen Volcanic	-0.18	0.05	0.35	0.02	0.62	0.11				
Little Big Horn							0.25	0.15	-0.42	0.01
Mammoth Cave	-0.15	0.05	0.08	0.36	1.42	0.04				

Table 1. Individual Park 1990-1999 Trend Results, continued

Mesa Verde	-0.11	0.08	0.18	0.19	0.96	0.07	0.23	0.24	-0.28	0.19
Mount Rainier	-0.29	0.04	-0.40	0.02	-1.09	0.28				
North Cascades							-0.07	0.08	-0.24	0.02
Olympic					-0.09	0.30	-0.01	0.36	0.13	0.23
Organ Pipe Cactus							0.97	0.18	0.09	0.46
Petrified Forest	-0.15	0.05	0.03	0.43						
Pinnacles	-0.06	0.24	-0.34	0.02	-0.21	0.08				
Point Reyes	-0.06	0.36	-0.26	0.05						
Redwood	-0.25	0.04	-0.22	0.11						
Rocky Mountain *	-0.10	0.15	-0.01	0.43	0.96	0.04	0.15	0.19	-0.25	0.15
Saguaro					-0.02	0.50				
Sequoia					-0.29	0.36	-0.96	0.04	-0.66	0.01
Shenandoah	-0.19	0.11	-0.10	0.19	0.94	0.08	0.19	0.36	-0.40	0.09
Theodore Roosevelt					0.29	0.18	0.17	0.27	-0.54	0.02
Tonto	-0.03	0.43	0.14	0.08						
Voyageurs					1.23	0.01				
Washington D.C.	-0.45	0.01	-0.35	<0.01						
Yellowstone	-0.37	<0.01	-0.19	0.19	1.15	0.01	-0.23	0.19	-0.57	0.02
Yosemite	-0.18	0.15	0.20	0.19	-0.64	0.36	0.14	0.45	-0.16	0.36

* Deposition trends from Beaver Meadows; Loch Vale data suggest decreasing nitrate trend

(green) = Improving air quality trend, statistically significant (p <= 0.15)

(red) = Degrading air quality trend, statistically significant (p <= 0.15)

(gray) = Improving air quality trend, NOT statistically significant

(yellow) = Degrading air quality trend, NOT statistically significant

Figure 1

Ozone Trends in Eastern U.S. National Parks, 1990-1999
Average of the May-Sep Ozone Daily Maxima

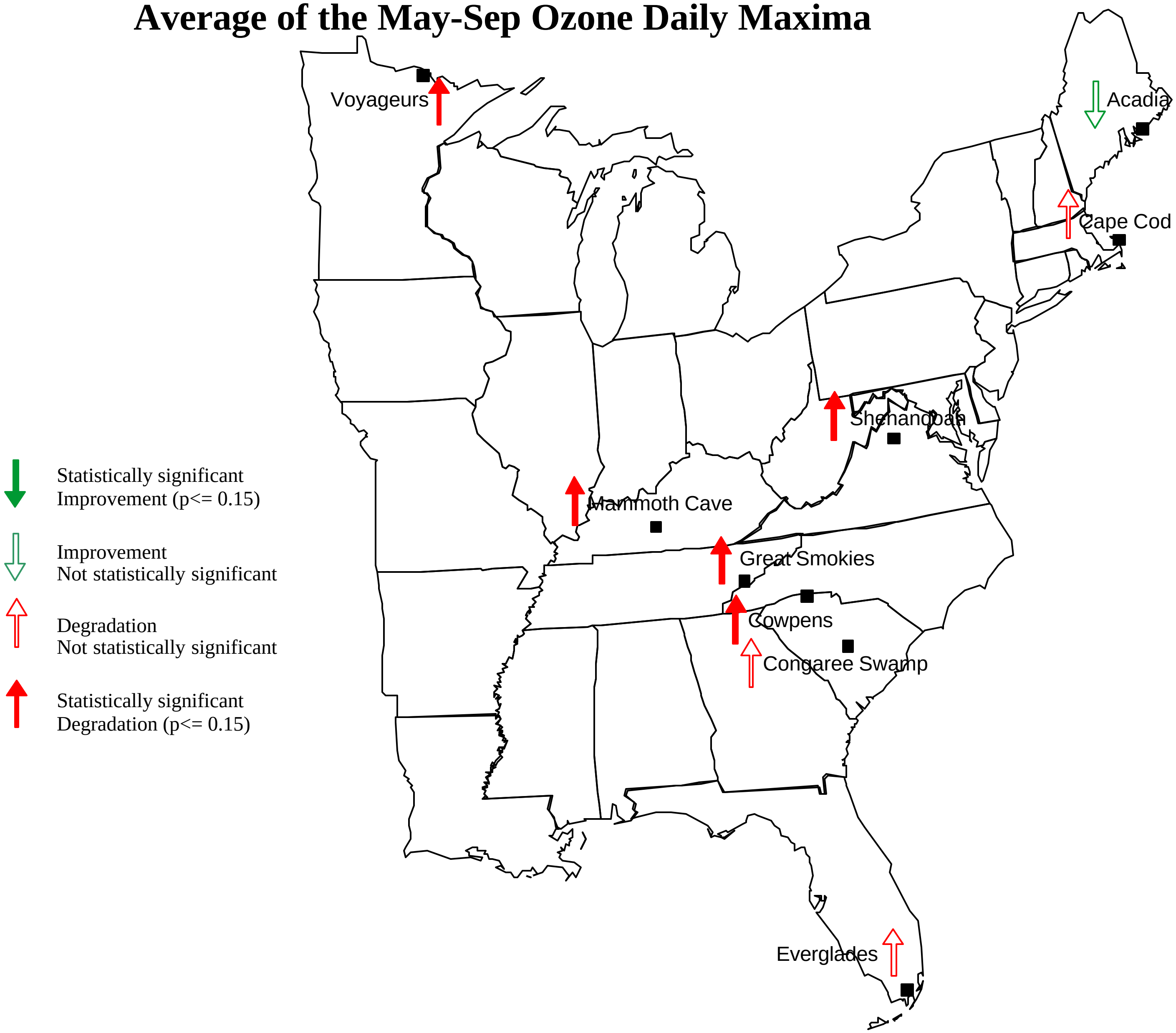
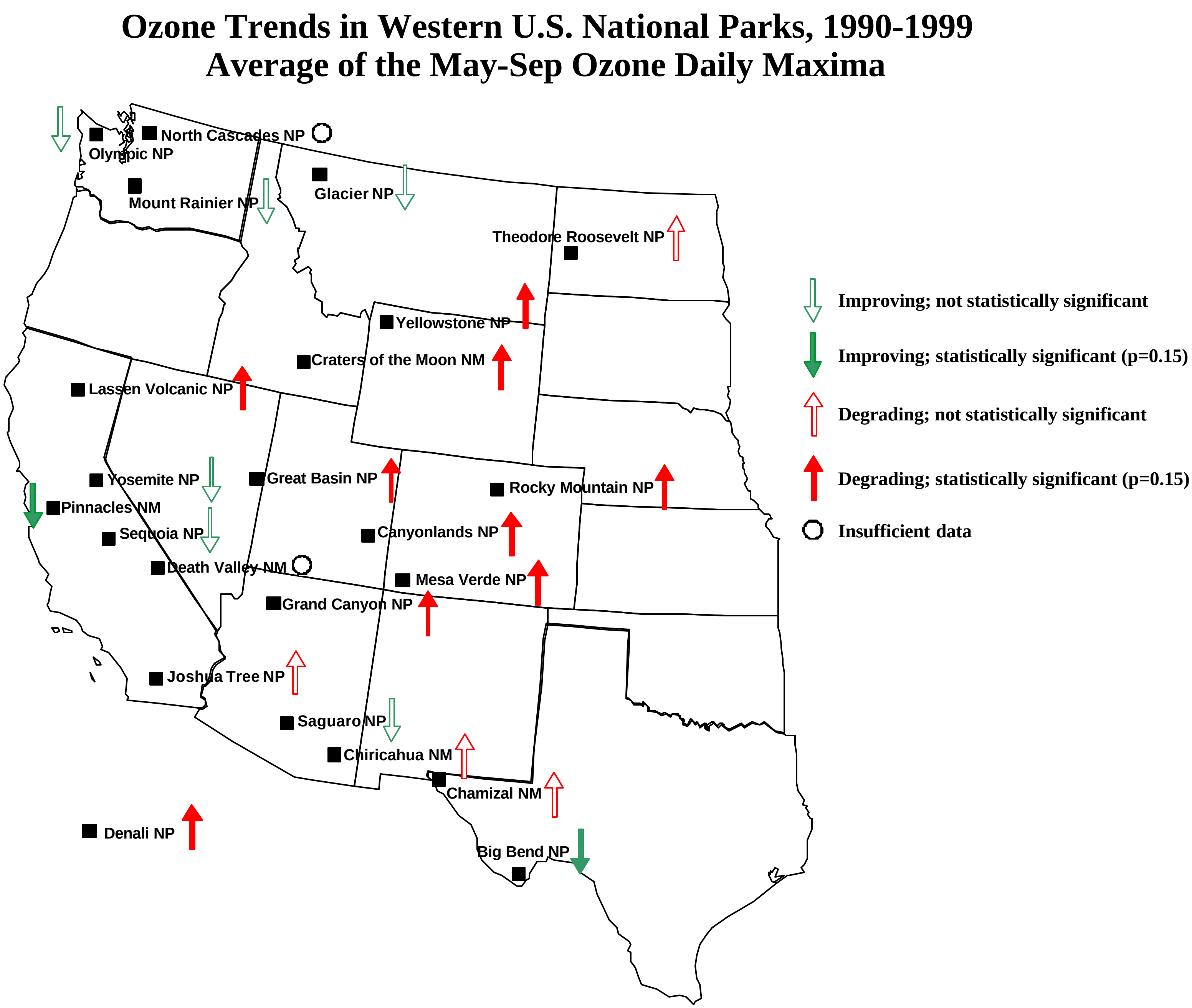


Figure 2



Ozone Trends in Western U.S. National Parks, 1990-1999
Average of the May-Sep Ozone Daily Maxima
North Cascades NP
Olympic NP
Mount Rainier NP
Glacier NP
Theodore Roosevelt NP
Yellowstone NP
Craters of the Moon NM
Lassen Volcanic NP
Yosemite NP
Great Basin NP
Rocky Mountain NP
Pinnacles NM
Sequoia NP
Canyonlands NP
Death Valley NM
Mesa Verde NP
Grand Canyon NP
Joshua Tree NP
Saguaro NP
Chiricahua NM
Chamizal NM
Denali NP
Big Bend NP
Improving; not statistically significant
Improving; statistically significant (p=0.15)
Degrading; not statistically significant
Degrading; statistically significant (p=0.15)
Insufficient data

Figure 3

Trends in Annual Sulfate Concentrations (ueq/l) in Precipitation
U.S. National Parks, 1990-1999

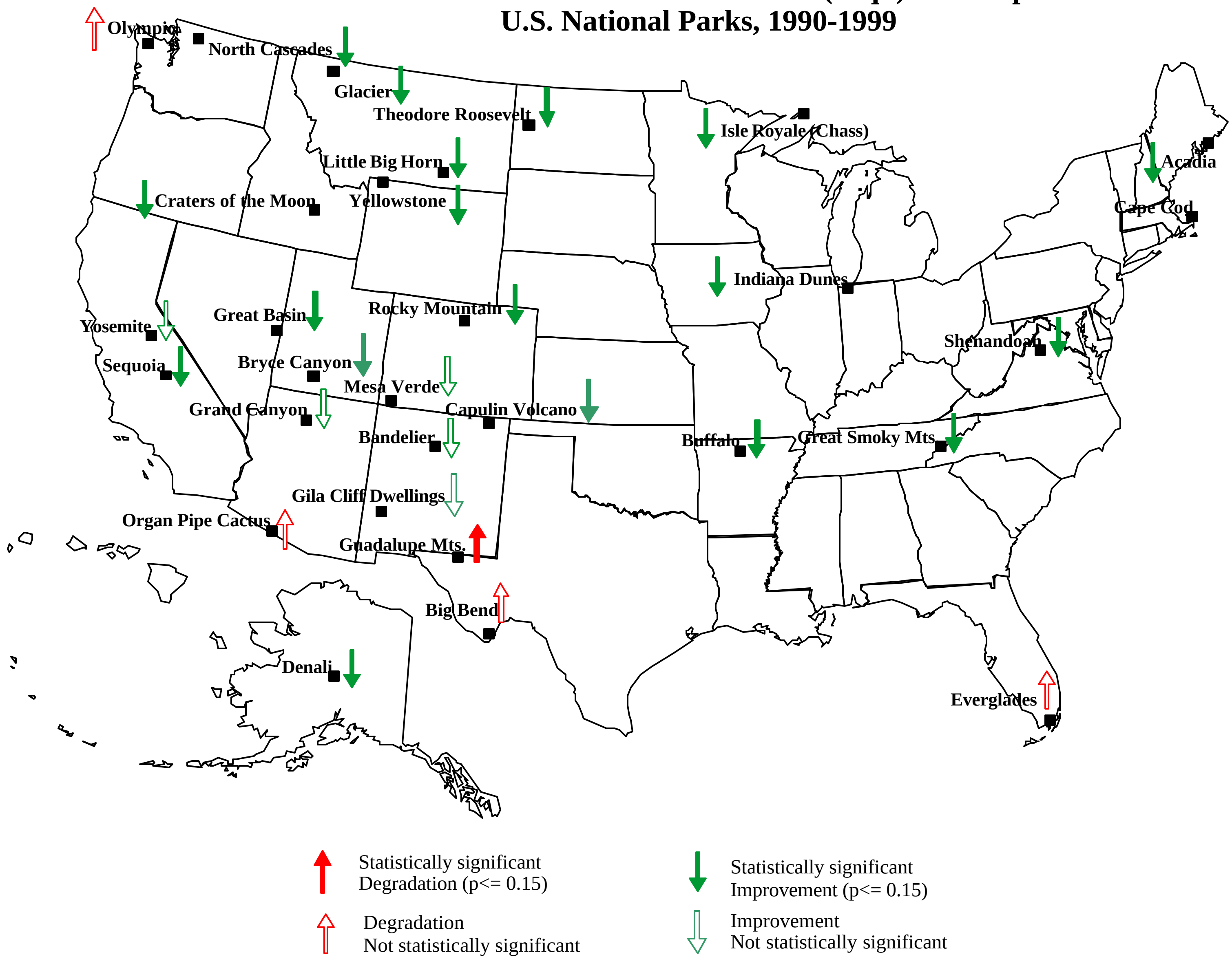


Figure 4

Trends in Annual Nitrate Concentrations (ueq/l) in Precipitation
U.S. National Parks, 1990-1999

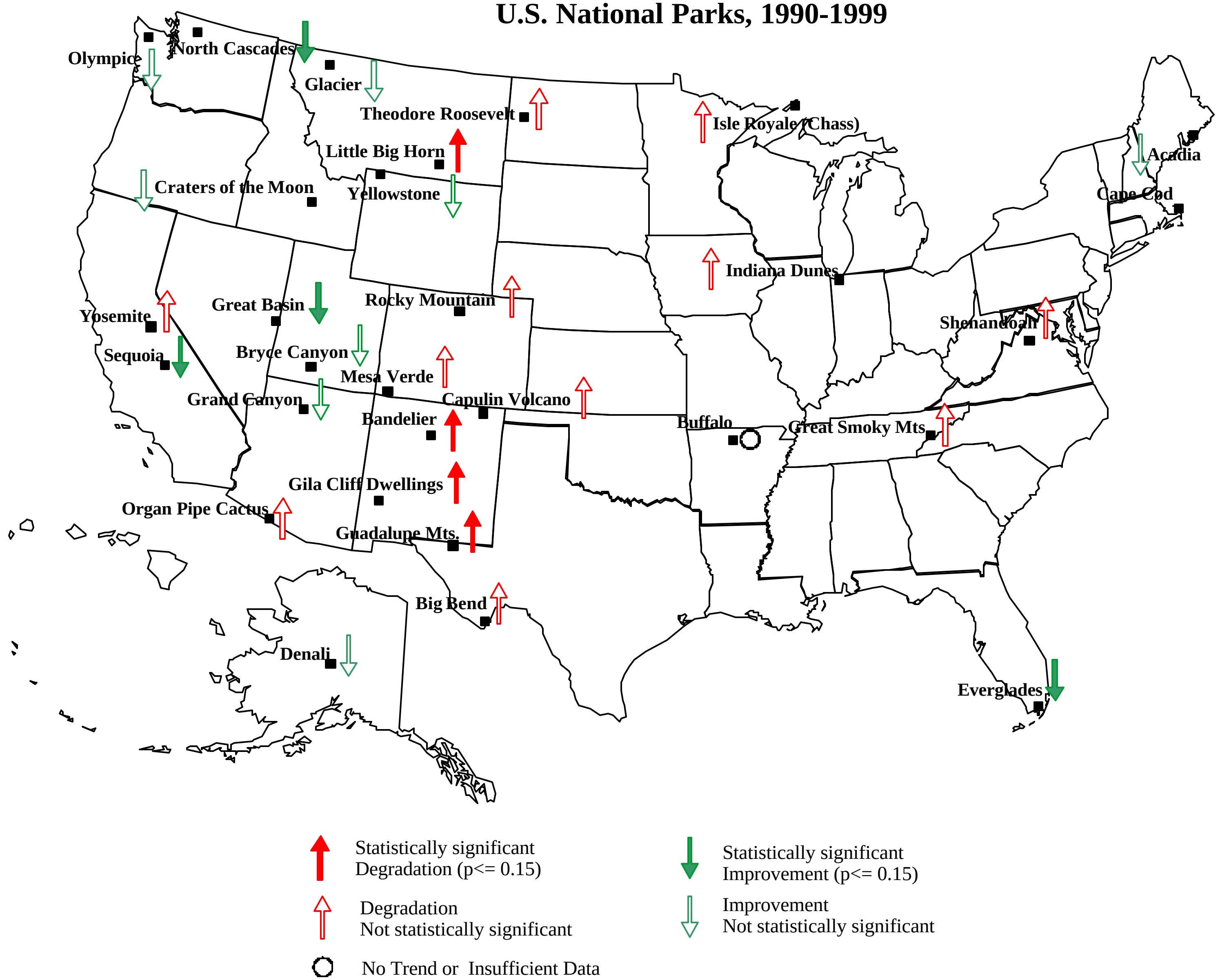
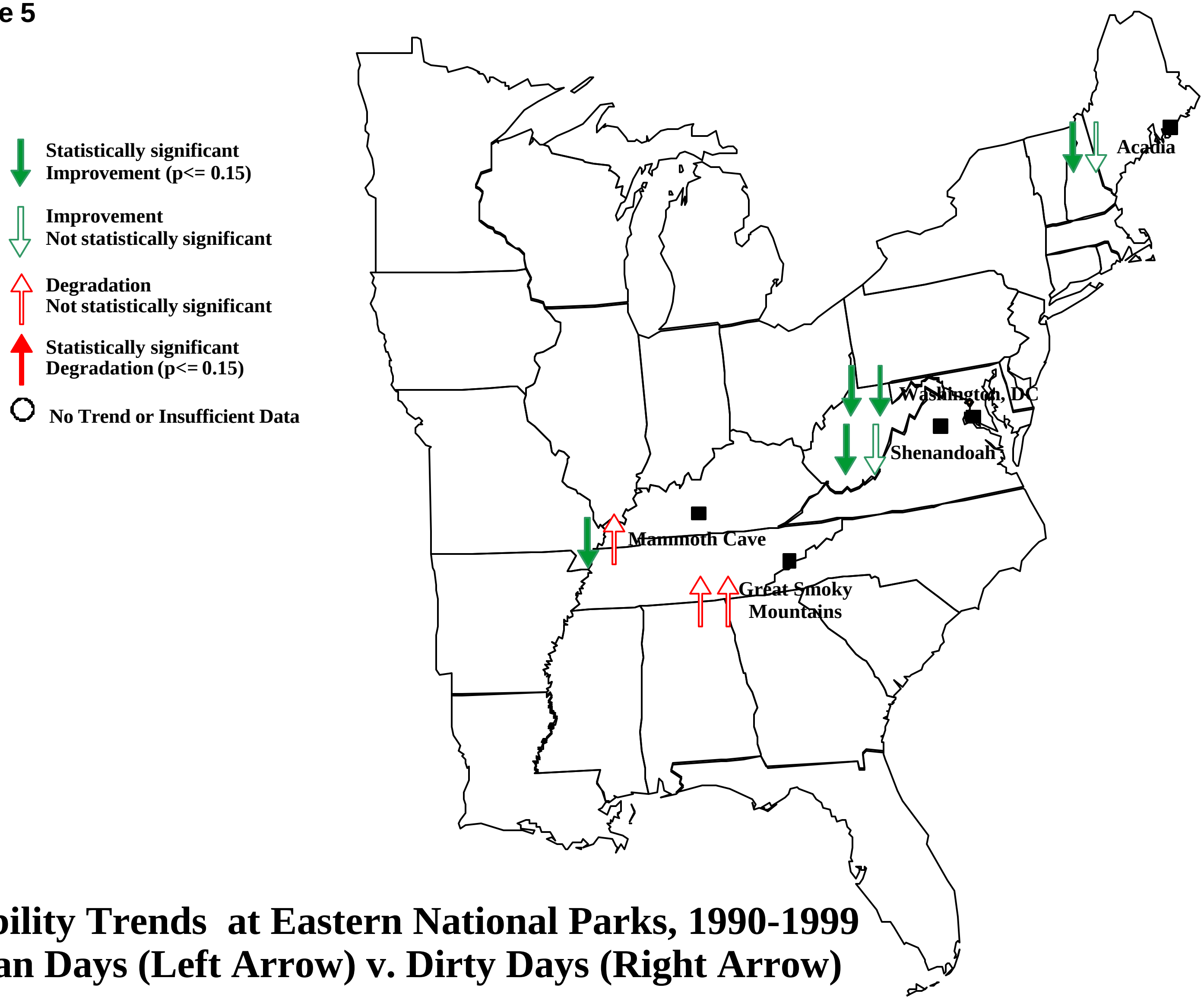


Figure 5



Visibility Trends at Eastern National Parks, 1990-1999
Clean Days (Left Arrow) v. Dirty Days (Right Arrow)

Figure 6

Visibility Trends at Western National Parks, 1990-1999
Clean Days (Left Arrow) v. Dirty Days (Right Arrow)