National Park Service
U.S. Department of the Interior
San Francisco Bay Area Network
Inventory and Monitoring Program
Research Project Summary February 2009

Air Quality Monitoring in National Parks

Importance: *Air pollution in national parks adversely affects park resources and visitors.*

Air pollution in national parks adversely affects the health of people, plants, and wildlife, changes soil and water quality, and diminishes park views and visitor enjoyment (Figure 1). In order to meet their Clean Air Act requirement to protect park air quality, The National Park Service (NPS) monitors air quality in parks across the country, including those in the San Francisco Bay area. Air pollution in Bay area parks comes mostly from nearby urban and suburban areas. Because these sources are outside of park boundaries and therefore are not under NPS control, the parks also work with other federal, state, and local groups on pollution control measures.



Figure 1. Photographs of a good air quality day (left) and a bad one (right) show how air quality affects the vistas at Point Reyes National Seashore at Chimney Rock, just east of the Lighthouse Visitor Center. Photos from http://vista.cira.colostate.edu/Datawarehouse/IMPROVE/Data/Photos/PORE/start.htm

Monitoring Program: *NPS monitors ozone, visibility, and atmospheric deposition in 60 national parks to determine if national air quality standards and NPS management goals are being met. NPS also funds special studies on the ecological effects of air pollution.*

As of 2006, NPS had collected enough data to assess air quality conditions and trends in 52 of the 60 monitored parks. Eighty nine other parks had data from nearby state and local monitoring stations, bringing the total number of parks with current air quality data to 141. The park service uses this data and the results of ecological effects studies to determine if national and state air quality standards are being met, and to measure progress towards its goal to stabilize or improve air quality in 70 percent of monitored parks. This information is also used to make recommendations to federal, state, and local air pollution regulators and in public workshops with park stakeholders when dealing with pollution sources outside of the parks.

Air quality indicators measured include:

- **Ozone** (adversely affects human health and sensitive vegetation)
- **Visibility** (an indicator of how well and how far visitors can see)
- **Atmospheric deposition of nitrogen and sulfur** (cause acidification and/or fertilization of soil and water)

NPS calculates a condition index and assesses air quality trends annually for each of these three parameters. This condition index assigns one of three categories to the park: good (blue), moderate (yellow), or of significant concern (red). Furthermore, air quality is rated as 'improving' or 'stable' if none of the three measures shows a statistically significant downward trend (Figure 2).

Status and Trends: *Air quality in national parks exceeded national NPS goals in 2006, including improvements in ozone levels in some San Francisco Bay Area parks.*

NPS exceeded its air quality performance goals in 2006, with 86 percent of parks showing stable or improving air quality trends (the target was 66 percent) and 82 percent meeting the Environmental Protection Agency's (EPA) national ambient air quality standards (the target was 78 percent). These strong numbers are in part due to effective pollution control programs in urban areas near many of the parks. These improving trends are expected to continue as regulations on motor vehicle and power plant emissions take effect over the next few years.

Ozone:
Fifty nine percent of parks have good to moderate ozone levels or are improving, and all but one of the 24 parks where ozone is a concern have a stable trend. In the San Francisco Bay area, Eugene O'Neill National Historic Site, Fort Point National Historic Site, Golden Gate National Recreation Area, John Muir National Historic Site, Muir Woods National Monument, Point Reyes National Seashore, and the Presidio of San Francisco do not meet national ozone standards set by the EPA. Recent data however, show improving trends at some of these sites based on NPS standards (Figure 2).

Air Quality Conditions in San Francisco Bay Area Parks

Park	Condition and Trend Symbol			
	Visibility	Nitrogen Deposition	Sulfur Deposition	Ozone
Pinnacles National Monument	⇔			⇑
Golden Gate National Recreation Area	⇔			⇔
Muir Woods National Monument	⇔			⇑
Presidio of San Francisco	⇔			⇑
John Muir National Historic Site	⇔			
Point Reyes National Seashore	⇔			

Figure 2. Air quality indices for San Francisco Bay area parks based on 2001-2005 data. For each air quality measure, a blue circle indicates a "good" rating, yellow a "moderate" rating, and red a rating of "significant concern." The arrows show the direction of the trend (if any). A blue up arrow indicates an improving trend, a yellow double-headed horizontal arrow indicates no trend, and a red down arrow indicates a worsening trend. An empty box means that that particular parameter was not measured in the *2006 Annual Performance & Progress Report: Air Quality in National Parks*, the source of this figure.

Visibility:
Ninety seven percent of parks monitored in 2006 were stable or had improved visibility (target was 88 percent) and San Francisco Bay area parks have also been stable (Figure 2). Recently adopted state and federal regulations to improve visibility in some national parks including Point Reyes National Seashore and Pinnacles National Monument by 2018 should help continue to improve conditions.

Atmospheric Deposition:
Sixty percent of monitored parks nationwide have a good or moderate sulfur deposition levels, or are showing an improving trend, and none of the parks with a significant sulfur deposition concern have a degrading trend. However, nitrogen deposition remains a problem with only 18 percent of the parks in good or moderate condition and none showing an improving trend. In the San Francisco Bay area, most nitrogen deposition comes from mobile sources such as cars, trains, trucks, and airplanes, and most sulfer deposition comes from oil refineries. Pinnacles National Monument has the lowest levels of both nitrogen and sulfur deposition of all Bay area parks due to its distance from urban areas.

Additional Resources:

October 3, 2007. 2006 Annual Performance & Progress Report: Air Quality in National Parks.

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For NPS air quality information: http://www.nature.nps.gov/air/ and http://science.nature.nps.gov/im/units/sfan/vital_signs/air_quality/air_quality.cfm

For live feed of the view of Point Reyes Beach: http://www.nature.nps.gov/air/WebCams/parks/porecam/porecam.cfm

For more information about local air quality issues and restrictions: http://www.sparetheair.org/