



Air Quality Monitoring

Importance

Both the Clean Air Act and the National Park Service (NPS) Organic Act protect air resources in national parks. Six Northern Colorado Plateau Network (NCPN) parks are designated as Class I areas, which receive the highest protection under the Clean Air Act: Arches, Black Canyon of the Gunnison, Bryce Canyon, Canyonlands, Capitol Reef, and Zion national parks. Understanding changes in air quality can aid in interpreting changes in other monitored vital signs and support evaluation of compliance with legislative and reporting requirements. The NCPN has identified several components of air quality as high-priority vital signs for monitoring. Over the past three decades, the NPS has developed several internal and cooperative programs for monitoring various measures of air quality (see table, next page). The NCPN will acquire and analyze data from existing stations and report on data specific to park units.

Long-term Monitoring

The NCPN acquires, analyzes, and reports on air quality data primarily from the web-based program archives of four ongoing air quality monitoring programs: the Clean Air Status and Trends Network (CASTNET), the National Atmospheric Deposition Program (NADP), the National Park Service–Air Resources Division Gaseous Pollutant Monitoring Program, and the Interagency Monitoring of Protected Visual Environments (IMPROVE) Program. The first NCPN air quality report was produced in 2009 (see next page).

NCPN air quality monitoring objectives are to:

1. Determine the seasonal and annual status and trends in concentrations of N- and S-containing ions from wet deposition at Bryce Canyon and Canyonlands national parks;
2. Determine the seasonal and annual status and trends in dry-deposition chemistry at Canyonlands NP;
3. Determine the seasonal and annual status and trends in ozone concentration at Canyonlands NP, Colorado NM, Dinosaur NM, and Zion NP, and make status estimates for Timpanogos Cave NM, which has a station in the vicinity of the park; and
4. Determine the seasonal and annual status and trends in concentrations of visibility-reducing pollutants at Bryce Canyon, Canyonlands, Capitol Reef, and Zion national parks from stations in the park and make



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IMPROVE fine-particle sampler modules, Canyonlands National Park. Data from the filters in the modules are used to estimate visibility conditions.

status estimates for Arches NP, Black Canyon of the Gunnison NP, Cedar Breaks NM, Curecanti NRA, and Natural Bridges NM based on stations from the vicinity.

Management Applications

Information gathered from this protocol will:

- Support evaluation of compliance with legislative requirements of the Clean Air Act, Regional Haze Guidelines, and the Government Performance and Results Act; and
- Facilitate interpretation of other NCPN vital signs, such as vegetation and water quality measurements.

Contact

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Network park units where air quality is monitored

Arches NP	Colorado NM
Black Canyon of the Gunnison NP	Curecanti NRA
Bryce Canyon NP	Dinosaur NM
Canyonlands NP	Natural Bridges NM
Capitol Reef NP	Timpanogos Cave NM
Cedar Breaks NM	Zion NP

NP = National Park; NM = National Monument
NRA = National Recreation Area

Highlights from the 2008 NCPN Air Quality Report

Some type of air quality monitoring occurs within the boundaries of six NCPN park units, and an additional six park units have air quality monitoring stations close enough to the park to be reasonably considered representative of some aspect of the park's air quality (see table). The first air quality report for the NCPN, based on a recent report by the NPS Air Resources Division (NPS-ARD), was released in 2009.

Most trends stable or improving

Of the 12 NCPN parks monitored, nine were determined to be meeting the 2008 Government Performance and Results Act (GPRA) goals for air quality. One (Canyonlands NP) was found not to be fully meeting 2008 GPRA goals, and two (Colorado and Dinosaur national monuments) had too little information to determine whether GPRA goals were being met. All (100% of) reporting NCPN parks showed stable or improving trends in visibility (9 parks), 100% showed stable or improving trends in ozone concentrations (3 of 3 parks; 2 could not be determined due to limited data), and 50% showed stable or improving trends in atmospheric deposition (2 parks).

Canyonlands NP failed to meet 2008 GPRA goals for air quality due to increasing trends in ammonium. There has been an increase in ammonium in central and northern Utah over the past 10 years, and Canyonlands was one of eight national park units (of 50) shown to have increasing trends in ammonium from 1998 to 2007.

Deposition, ozone, and visibility

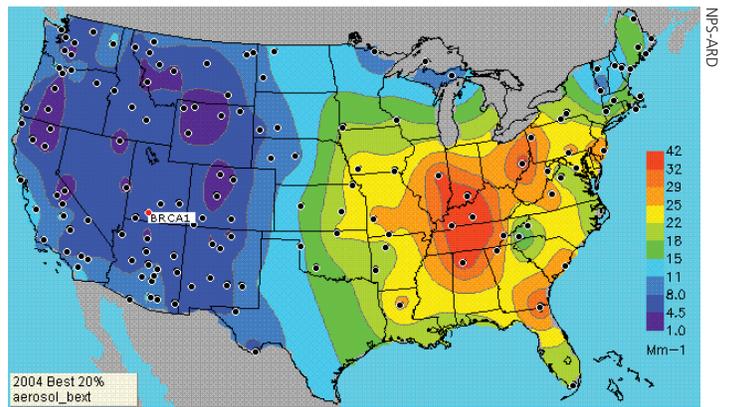
Nitrogen deposition was estimated to be in good condition at Canyonlands NP and moderate condition at Bryce Canyon NP. Sulfur deposition was estimated to be in good condition at Bryce Canyon and Canyonlands national parks.

Ozone levels were estimated to be in moderate condition at Canyonlands NP and Dinosaur NM, of significant concern at Timpanogos Cave NM and Zion NP, and could not be determined at Colorado NM.

Visibility was estimated to be in moderate condition at Arches, Black Canyon of the Gunnison, Bryce Canyon, Canyonlands, and Capitol Reef national parks, as well as at Cedar Breaks and Natural Bridges national monuments and Curecanti National Recreation Area. Visibility was of significant concern at Zion NP. Across the NCPN, visibility has generally improved on the clearest days over the past 10 years.

Looking forward

The NCPN is characterized by some of the better visibility in the country (see graphic), and the NPS-ARD expects air quality in parks to improve as regulations aimed at reducing tail-pipe emissions from motor vehicles and pollution from electric-generating facilities take full effect over the next few years. In addition, state and tribal governments, with assistance from regional planning organizations, are in the process of developing programs to improve visibility in national parks and wilderness areas in response to EPA regulations.



Spatial distribution of light extinction on the 20% best (clearest) days in the U.S., 2004. Location of Bryce Canyon National Park is noted on the map.

Summary of ambient air quality monitoring in and nearby to NCPN parks.

Park	Wet deposition (N and S)	Dry deposition	Ozone	Visibility
Parks with monitoring stations within their boundaries				
Bryce Canyon NP	NADP/NTN	-	-	IMPROVE
Canyonlands NP	NADP/NTN	CASTNet	CASTNet	IMPROVE
Capitol Reef NP	-	-	-	IMPROVE
Colorado NM	-	-	POMS	-
Dinosaur NM	-	-	POMS	-
Zion NP	-	-	NPS-GPMP	IMPROVE
Parks with monitoring stations nearby				
Arches NP	-	-	-	IMPROVE
Black Canyon of the Gunnison NP	-	-	-	IMPROVE
Cedar Breaks NM	-	-	-	IMPROVE
Curecanti NRA	-	-	-	IMPROVE
Natural Bridges NM	-	-	-	IMPROVE
Timpanogos Cave NM	-	-	EPA	-

Dark blue cells represent status of "significant concern." All other parameters were rated "moderate" or "good" in 2008.

CASTNet = Clean Air Status and Trends Network; EPA = Environmental Protection Agency; IMPROVE = Interagency Monitoring of Protected Visual Environments; NADP/NTN = National Atmospheric Deposition Program/National Trends Network; NPS-GPMP = National Park Service Gaseous Pollutant Monitoring Program; POMS = portable ozone monitoring system (short-term)

Ozone could become a concern in NCPN parks, but little is known about the effects of ozone on plants in the southwest.

Relative to atmospheric deposition, many states are investigating the adoption of 21st century technology, negotiating tighter pollution controls (including mercury), and securing emission-offset agreements.