



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.



NATIONAL PARK SERVICE

Strike Valley overlook, Capitol Reef NP.

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 second NCPN air quality report was produced in 2010 (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 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.

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 2009 NCPN Air Quality Report

Most trends stable or improving

Of the 12 NCPN parks monitored, 10 were determined to be meeting the 2009 Government Performance and Results Act (GPRA) goals for air quality. Two units (Colorado and Dinosaur NMs) had too little information to determine whether GPRA goals were being met. Trends information is based on data collected during 1999–2008.

All nine reporting NCPN parks showed improving visibility on the 20% clearest days, but no trend on the 20% haziest days. Ozone trends were improving at Timpanogos Cave NM and showed no trend at Canyonlands NP; trend could not be determined for Colorado and Dinosaur NMs and Zion NP, due to limited data. Atmospheric deposition showed no trend for nitrate at Bryce Canyon and Canyonlands NPs, showed an improving trend for sulfate at Bryce Canyon, and no trend for sulfate at Canyonlands (see table).

Deposition, ozone, and visibility condition

Information on conditions is based on data collected during 2004–2008. Nitrogen (N) deposition was estimated to be in moderate condition at Bryce Canyon NP and good condition at Canyonlands NP (see table). Sulfur (S) deposition was estimated to be in good condition at Bryce Canyon and Canyonlands NPs.

Ozone levels were estimated to be in moderate condition at Canyonlands NP, and could not be determined at Colorado or Dinosaur national monuments or Zion NP, due to limited data. Ozone levels were of significant concern at Timpanogos Cave NM; this was the network's only air quality parameter not estimated to be in good or moderate condition.

Visibility was estimated to be in moderate condition at all nine monitored parks.

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 tailpipe 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.

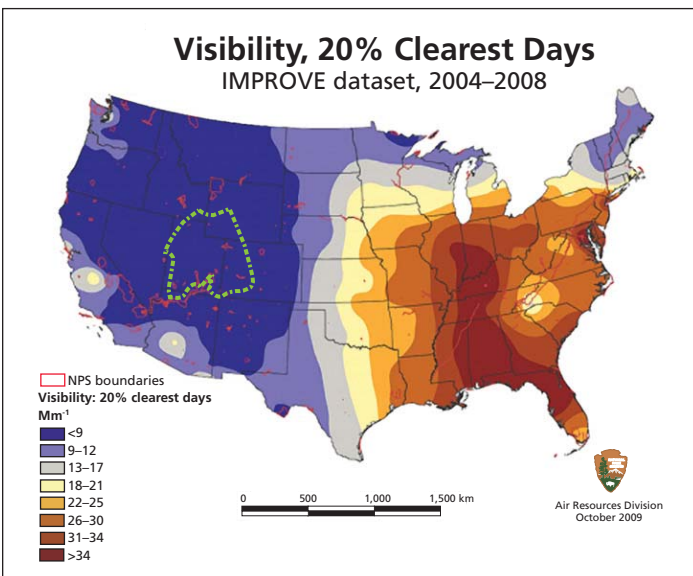
Ozone could become a concern in NCPN parks, but little is known about the effects of ozone on plants in the Southwest.

Relative to atmospheric deposition, ammonium (NH_4) concentrations are still a concern in some areas of the network. Bryce Canyon and Canyonlands national parks have seen significant increasing trends in NH_4 over the past 20 years. In 2008, Canyonlands NP failed to meet its GPRA goal for deposition due to increasing ammonium levels over the past 10 years. On a positive note, many states are investigating the adoption of 21st century technology, negotiating tighter pollution controls (including for mercury), and securing emission-offset agreements.

Contact: Dustin Perkins, dustin_w_perkins@nps.gov

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

Park	Deposition		Ozone	Visibility
	Nitrate/N	Sulfate/S		
Parks with monitoring stations within their boundaries				
Bryce Canyon NP			-	
Canyonlands NP				
Capitol Reef NP	-	-	-	
Colorado NM	-	-		-
Dinosaur NM	-	-		-
Zion NP	-	-		
Parks with monitoring stations nearby				
Arches NP	-	-	-	
Black Canyon of the Gunnison NP	-	-	-	
Cedar Breaks NM	-	-	-	
Curecanti NRA	-	-	-	
Natural Bridges NM	-	-	-	
Timpanogos Cave NM	-	-		-
	Good condition, improving trend			Moderate condition, no trend
	Good condition, no trend			Condition of significant concern, improving trend
	Moderate condition, trend not available			Condition of significant concern, trend not available



Spatial distribution of light extinction on the 20% best (clearest) days in the U.S., 2004–2008. Dotted green line represents NCPN boundary.