

Chihuahuan Desert Network

Air Quality Monitoring Brief

National Park Service
U.S. Department of the Interior

Intermountain Region
Inventory & Monitoring Program



Visibility at Guadalupe Mountains National Park and Carlsbad Caverns National Park

2011

Importance

Air pollution damages resources and values that national parks are mandated to protect. Both the Clean Air Act and the National Park Service (NPS) Organic Act protect air resources in national parks, and NPS managers have a special responsibility to protect park natural and cultural resources. The Chihuahuan Desert Network (CHDN) monitors air quality conditions to understand their interactions with physical and biological components of the ecosystem. At Guadalupe Mountains and Carlsbad Caverns National Parks, the CHDN has identified atmospheric deposition and visibility as high-priority vital signs for monitoring.

Long-term Monitoring

For Guadalupe Mountains National Park (NP), the CHDN acquires, analyzes, and reports on air quality data from the National Atmospheric Deposition Program/National Trends Network (NADP, wet deposition), National Park Service-Air Resources Division (NPS-ARD) Gaseous Pollutant Monitoring Program (ozone), and the Interagency Monitoring of Protected Visual Environments (IMPROVE) Program (visibility).

Because the NPS-Air Resources Division (ARD) has determined that particulate (visibility) monitors within 100 km (60 miles) may be reasonably considered representative of a park's air quality, the IMPROVE monitors at Guadalupe Mountains NP are also suitable for reporting air quality at Carlsbad Caverns National Park.

CHDN air quality monitoring objectives are to:

- Determine the conditions and spatial and temporal trends in ozone, nitrogen deposition, sulfur deposition, and visibility-reducing pollutants.
- Determine how ozone, nitrogen deposition, sulfur deposition, and visibility-reducing pollutants vary with associated vital signs (such as vegetation community composition, exotic plant status, and climate).

Management Applications

Information gathered from this protocol will support evaluation of compliance with legislative requirements of the Clean Air Act, regional haze guidelines, National Environmental Policy Act, and the Government Performance and Results Act (GPRA).



View of Lower Pine Spring Canyon from Hunter Peak, Guadalupe Mountains National Park.

NPS/WILLIAM LEGGETT

Park Overviews

Guadalupe Mountains NP is designated as a Class 1 air quality unit under the Clean Air Act, which means it receives the highest protection under the Act. The air quality related values (AQRVs) of Guadalupe Mountains NP are those resources that are potentially sensitive to air pollution, and include vegetation, wildlife, water quality, soils, and visibility.

Carlsbad Caverns NP is also designated as a Class 1 air quality unit, giving it the highest protection under the Clean Air Act. The AQRVs of Carlsbad Caverns NP are those resources that are potentially sensitive to air pollution, and include vegetation, wildlife, water quality, soils, and visibility. At present, visibility has been identified as the most sensitive AQRV in the park; other AQRVs may also be very sensitive, but have not been sufficiently studied. Although visibility in the park is still superior to

that in many parts of the country, visibility in the park is often impaired by light-scattering pollutants (haze).

Visibility

Overview

Visibility includes not only how far we can see, but how well we can see. Visibility is expressed in terms of the perceptible change in light extinction measured in deciviews (dv). Small pollutant particles in the air scatter and absorb light, causing haze and reducing visibility; as light extinction and dv increases, visibility decreases.

Visibility is monitored in parks and wilderness areas as part of the IMPROVE program, a cooperative effort that includes the U.S. Environmental Protection Agency, U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service, Bureau of Land Management, National Oceanic and Atmospheric Administration, and several interstate air-quality management organizations.

Monitoring Results

For visibility trends, light extinction is analyzed on the 20% clearest and haziest days. Long-term trends (1990-2008) show significant improvement ($p \leq 0.05$; decreasing light extinction trends) for the 20% clearest days; but significant degradation of visibility for the 20% haziest days. In 2008, the average light extinction for the 20% clearest days at Guadalupe Mountains was 5.62 dv, and 16.17 dv for the 20% haziest days (Figure 1). Natural visibility condition on the 20% clearest days was about 2 dv; on the 20% haziest days, 7 dv. The main contributors to haze in 2008 were ammonium sulfate (yellow

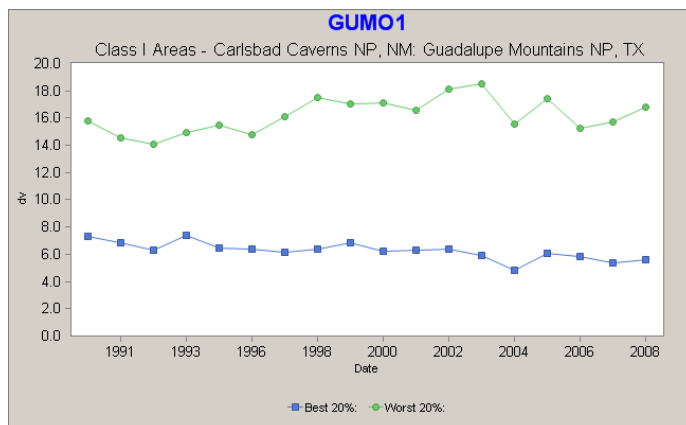


Figure 1. Trends in aerosol light extinction on the 20% best (clearest) days and the 20% worst (haziest) days, Guadalupe Mountains National Park, 1990-2008.

slice in Figure 2, primarily from coal-burning power plants), coarse mass (larger particles that include dust and pollen, gray slice in Figure 2), and organic carbon (from fires, vegetation, and human activities, green slice in Figure 2).

The NPS Air Resources Division uses an index to characterize each type of park air quality measure as good, moderate, or of significant concern. For 2009, visibility was in moderate condition with no trend for both Guadalupe Mountains NP and Carlsbad Caverns NP, and both parks met their 2009 GPRA goals of improving or not degrading visibility conditions.

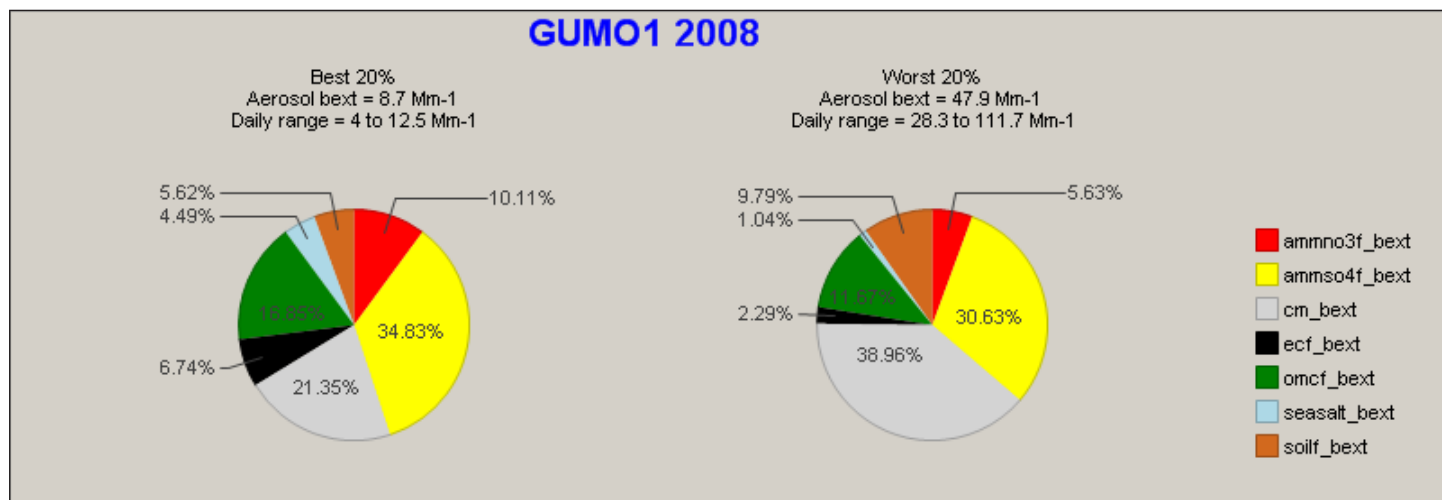


Figure 2. Composition of fine particles at Guadalupe Mountains National Park, 2008.



For more information

Chihuahuan Desert Inventory & Monitoring Network | National Park Service | Las Cruces, New Mexico
<http://science.nature.nps.gov/im/units/chdn/>