



# Visibility at Chiricahua National Monument

## Importance

Both the Clean Air Act and the National Park Service (NPS) Organic Act protect air resources in national parks. Chiricahua National Monument is designated as a Class I area, receiving the highest protection under the Clean Air Act. 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. At Chiricahua NM, the Sonoran Desert Network has identified atmospheric deposition, ozone, and visibility as high-priority vital signs for monitoring.

## Long-term Monitoring

For Chiricahua National Monument, the Sonoran Desert Network (SODN) acquires, analyzes, and reports on air quality data from the web-based program archives of the National Atmospheric Deposition Program/National Trends Network (wet deposition), Clean Air Status and Trends Network (dry 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-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 Chiricahua NM are also suitable for reporting on air quality at Fort Bowie National Historic Site.

SODN air quality monitoring objectives at Chiricahua NM are to:

1. Determine the seasonal and annual status and trends in concentrations of N- and S-containing ions and dry-deposition chemistry;
2. Determine the seasonal and annual status and trends in ozone concentration; and
3. Determine the seasonal and annual status and trends in concentrations of visibility-reducing pollutants.

## 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



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Performance and Results Act (GPRA); and

- Facilitate interpretation of other SODN vital signs, such as vegetation and water-quality measurements.

## Park Overview

Both local and distant air pollution sources affect air quality in Chiricahua NM. The park's air quality related values (AQRVs) 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 sensitive, but have not been sufficiently studied. Although visibility in the park is still superior to that in many parts of the country, it 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 often expressed in terms of light extinction measured in deciviews (dv). Small pollutant particles in the air scatter and absorb light, causing haze and reducing visibility. As light extinction increases, visibility decreases.

Chiricahua National Monument was designated a Class I air quality area in 1977. Visibility in Class I air quality areas has been granted special protection under the Clean Air Act through state air-quality permits and regional haze regulations.

The “regional haze” regulations require states to establish goals for each Class I area to improve visibility on the haziest 20% of days and ensure that no degradation occurs on the clearest 20% of days. A goal of regional haze regulations is to achieve natural visibility conditions by 2064, although individual states may make the case for a different long-term goal.

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, NPS, 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 on the 20% clearest and haziest days is analyzed. Natural visibility condition on the 20% clearest days is about 2 deciviews (dv); on the 20% haziest days, 7 dv. In 2008, the average light extinction for the 20% clearest days at Chiricahua NM was 3.94 dv. For the 20% hazi-

est days, light extinction was 12.23 dv (Figure 1). Light-extinction trends for the 20% clearest days decreased significantly (improving visibility) based on three-year running averages. Long-term and 10-year visibility trends at the park show a statistically significant improvement on clearest days and a non-statistically significant improvement for the 20% haziest days.

Visibility impairment results largely from small particles in the atmosphere. Figure 2 shows the contributions made by different classes of particles to haze. The primary visibility-impairing pollutants were ammonium sulfate, coarse mass, and organic carbon. Ammonium sulfate comes mainly from coal-fired power plants and smelters. Coarse mass consists of wind-blown dust, while organic carbon comes primarily from combustion of fossil fuels and vegetation.

For visibility condition, average light extinction is evaluated. Visibility conditions are rated as moderate at Chiricahua NM and Fort Bowie NHS, with no trend. Both parks are currently meeting their 2009 GPRAs goals for visibility.

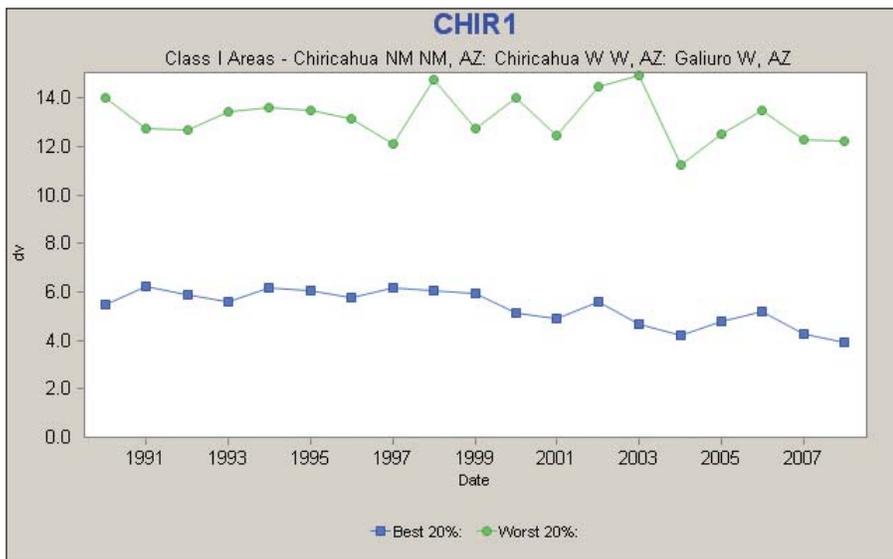


Figure 1. Trends in aerosol light extinction on the 20% best (clearest) days and 20% worst (haziest) days, Chiricahua National Monument, 1990–2008.

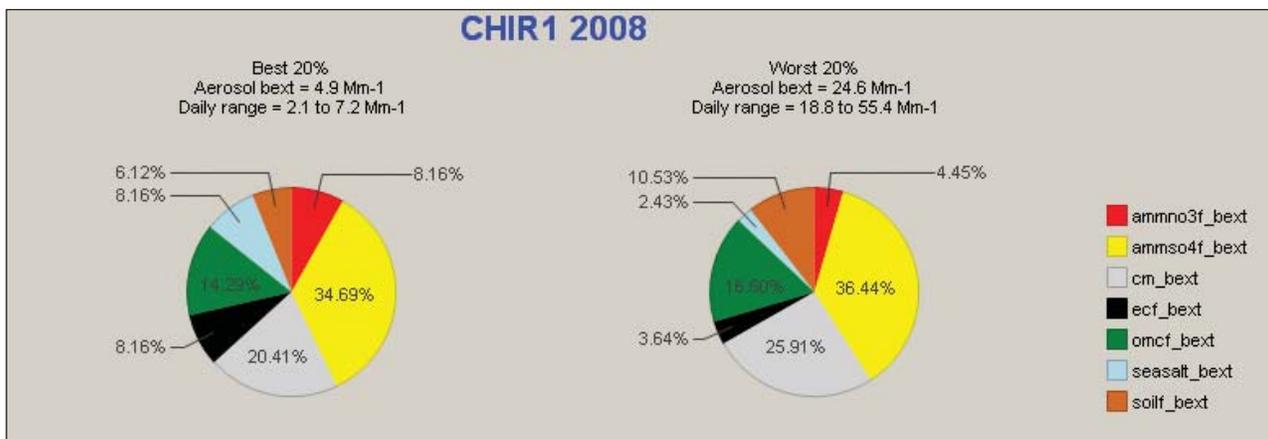


Figure 2. Composition of fine particles at Chiricahua National Monument, 2008.



### For more information

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<http://science.nature.nps.gov/im/units/sodn/>