



Washita Battlefield National Historic Site

Air Quality, Visibility

Air pollution damages resources and values that national parks are mandated to protect. National Park Service (NPS) managers have a special responsibility to monitor and protect air quality and related resources from the adverse effects of air pollution, and to provide recommendations to protect park natural and cultural resources. The Southern Plains Network (SOPN) monitors air quality conditions to understand their interactions with physical and biological components of the ecosystem. It is important to effectively evaluate the effects of these hazards on ecosystem health.

Both the Clean Air Act and the NPS Organic Act protect air resources in 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. At Washita Battlefield National Historic Site, the SOPN has identified visibility as a high-priority vital sign for monitoring.

Long-term Monitoring

For Washita Battlefield National Historic Site (NHS), the SOPN acquires, analyzes, and reports on air quality data from the web-based program archives of the Inter-agency Monitoring of Protected Visual Environments (IMPROVE) Program (visibility) and from the National Park Service-Air Resources Division (NPS-ARD). The NPS-ARD has determined that data collection stations within 100 km provide a reasonable representation of conditions at sites that have no monitoring stations locally. Washita Battlefield NHS uses data from Ellis County, which is about 64 km north of the site, to report on air quality trends.

SOPN 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 supports 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).



Washita Battlefield National Historic Site.

Park Overview

Most visitors who come to national parks expect clean air and clear views. Washita Battlefield NHS is nestled in the gently rolling plains where the 7th U.S. Cavalry, led by General Custer, attacked the Southern Cheyenne village of Chief Black Kettle in 1868. This site was also drastically affected by the Dust Bowl of the 1930s, and the restoration of natural conditions is a high priority. Although most parks in the SOPN are some distance from cities and other sources of pollution, they experience occasional poor air quality from pollutants such as nitrogen oxides, sulfur dioxide, ozone, and volatile organic compounds. These air pollutants may adversely affect air quality and natural resources, including vegetation, wildlife, soils, water quality, and visibility.

Washita Battlefield NHS is designated a Class II air quality area under the Clean Air Act, which means it is afforded somewhat less stringent protection than areas designated as Class I.

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 other 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. Ten-year trends (1999–2008) showed possible improvement ($p > 0.05$; decreasing light extinction trends) for the 20% haziest days (Figure 1), and no trend for the 20% clearest days.

In 2008, the average light extinction for the 20% clearest days at Washita Battlefield NHS (monitored at Ellis County) was 9.21 dv, and 20.28 dv for the 20% haziest days. Natural visibility condition on the 20% clearest

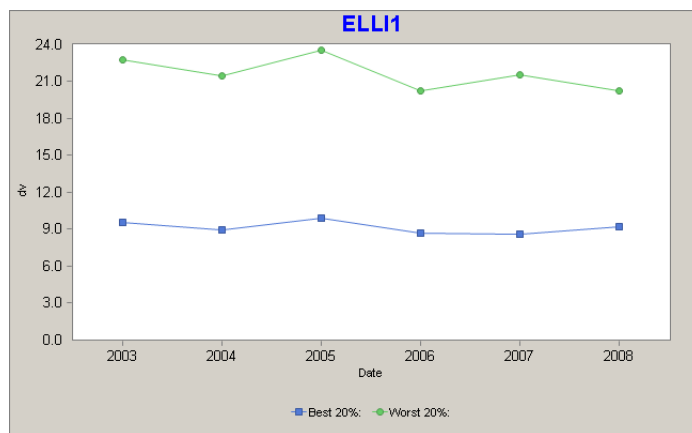


Figure 1. Trends in aerosol light extinction on the 20% best (clearest) days and 20% worst (haziest) days, Ellis County (representative of Washita Battlefield NHS), 2003–2008.

days was about 2 dv; on the 20% haziest days, 7 dv. The main contributors to haze in 2008 were ammonium sulfate (primarily from coal-burning power plants, yellow slice in Figure 2), ammonium nitrate (primarily from vehicle and industry emissions, red 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 a significant concern, and met the 2009 GPRA goal of improving or not degrading visibility conditions.

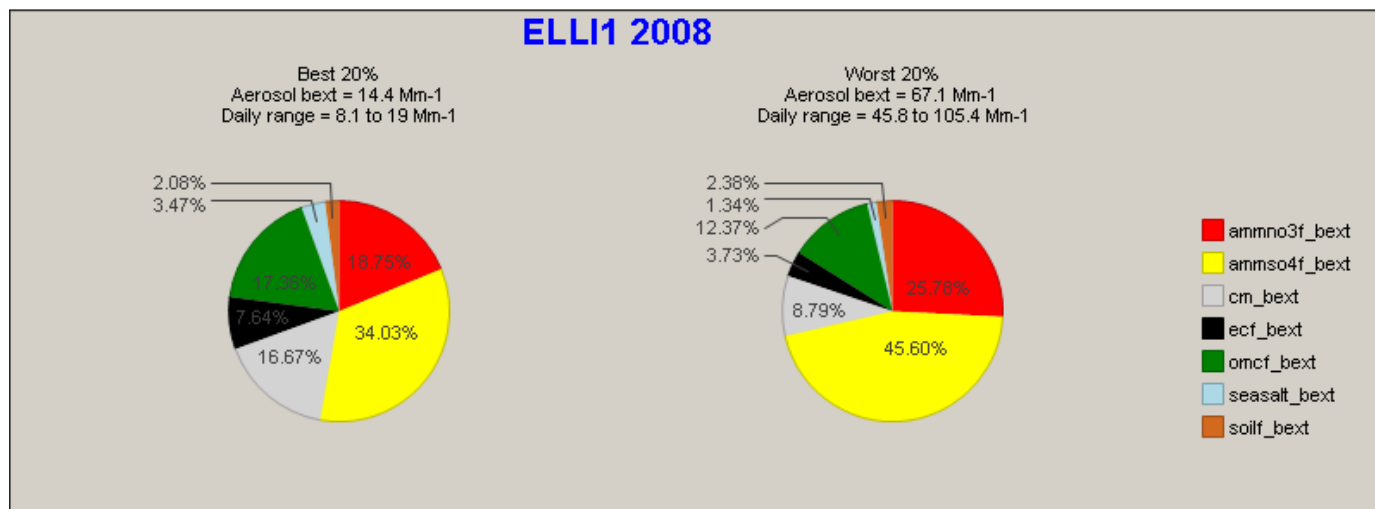


Figure 2. Composition of fine particles at Ellis County (representative of Washita Battlefield NHS), 2008.



For more information

Southern Plains Inventory & Monitoring Network | National Park Service | <http://science.nature.nps.gov/im/units/sopn/>