Visibility Data Summary: White Mountain Wilderness, NM

United States Department of Agriculture

Forest Service Air Program

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Introduction

Air pollution often has a subtle but critical impact on ecosystems and vistas, and can alter ecosystems by harming plants and animals, or changing soil or water chemistry. As a result, ecosystems then become more vulnerable to damage from insects and diseases, drought, or invasive species. Additionally, since many visitors to national forests value pristine areas with magnificent vistas, air pollution can spoil their experience and lessen their enjoyment of national forests.

Background

One of the most noticeable forms of air pollution is haze, a veil of smog-like pollution that can blur the view of many urban and rural areas. As part of the Clean Air Act, Congress has established a goal to prevent future and remedy existing visibility impairment in 156 protected national parks and wildernesses, known as Class I Areas. Federal rules require state and federal agencies to work together to improve visibility in these areas so that natural background conditions are achieved by the year 2064. Figure 1 shows a visual representation using the model WinHaze of how that improvement would appear at the White Mountain Wilderness Area.

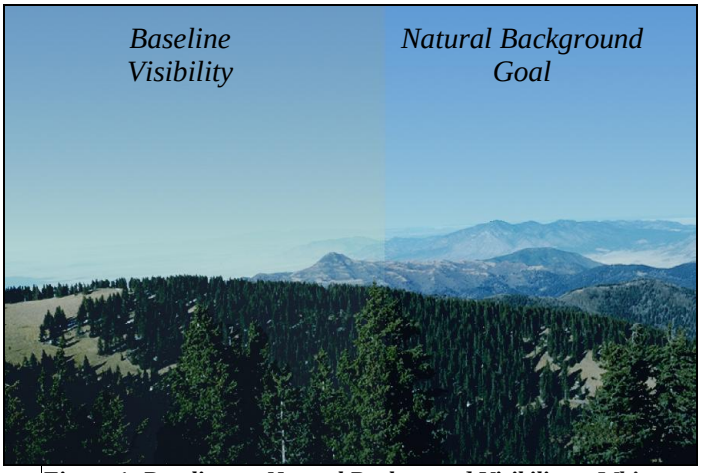

Figure 1: Baseline vs. Natural Background Visibility at White Mountain Wilderness Area in New Mexico

IMPROVE Monitoring Network

The IMPROVE (Interagency Monitoring of Protected Visual Environments) monitoring network collects aerosol samples at monitors throughout the country, which are then analyzed to obtain a complete chemical profile of the airborne particles that are affecting visibility in the area. The data are used to establish baseline visibility conditions and track changes over time, helping scientists understand the causes of haze.

About This Location

White Mountain Wilderness Area is a protected Class I Area located in the Lincoln National Forest in central New Mexico, as shown in Figure 2.

Figure 2: Location of White Mountain Wilderness Area

An IMPROVE monitor was established near the Sierra Blanca Regional Airport in 2002 to assess visibility impairment at the White Mountain Wilderness. An analysis of the monitoring data indicates that sulfates are the largest contributor to visibility impairment, as shown in Figure 3 in units of light extinction.

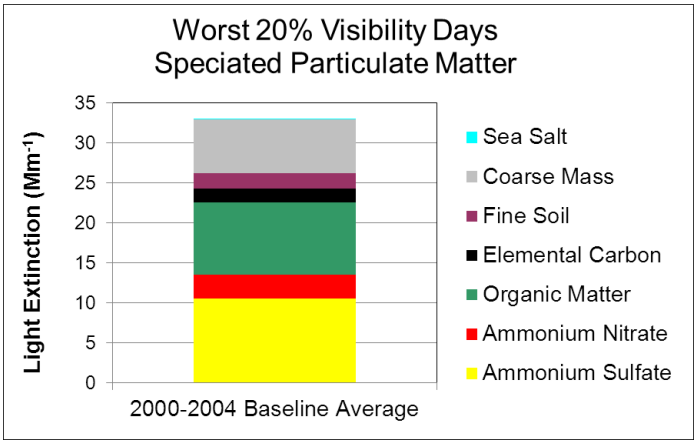

Figure 3: Composition of Particulate Matter on Haziest Days at White Mountain Wilderness Area

What Pollutants Are Reducing Visibility?

Regional haze comes from a variety of anthropogenic (man-made) and natural sources. Typical visibility-impairing pollutants such as sulfates, nitrates, and organic carbon are identified in the IMPROVE data and can help pinpoint nearby sources that are contributing to regional haze at a particular location.

Table 1 shows the most common pollutants and their sources.

Table 1: Sources of Regional Haze Pollutants

Pollutant	*Anthropogenic Sources*	*Natural Sources*
Sulfates	Coal-Fired Power Plants, Diesel Engines, Industrial Boilers	Volcanoes
Organic Carbon	Incineration, Household Heating	Fire, Vegetation
Nitrates	Cars & Trucks, Off-Road Vehicles, Industrial Boilers, Agriculture	Soils, Lightning, Fire
Fine Soil	Off-Road Vehicles, Agriculture	Wind-Blown Dust
Elemental Carbon	Soot, Diesel Engines	Fire
Fine Particulate Matter	Combustion Processes, Roads	Fire
Coarse Particulate Matter	Construction, Roads, Woodstoves, Fireplaces	Wind-Blown Dust, Fire

What Is Being Done to Improve Visibility?

Federal and state agencies analyze IMPROVE monitoring data, like Figure 3, to identify the pollutants that impair visibility in each Class I Area. Nearby sources of these pollutants are then scrutinized to determine if emissions can be further reduced, usually through the application of pollution control technology. The state is required to develop a plan (SIP, or State Implementation Plan) to improve visibility at Class I areas, and the Forest Service provides input to this process.

An example of regulatory action in the state's SIP includes the application of Best Available Retrofit Technology (BART) to large emissions sources, which should result in reduced sulfur emissions. Since sulfates are the largest contributors to regional haze at this site, visibility is expected to improve.

Is Visibility Improving at This Location?

Visibility is quantified using either standard visual range (SVR) or deciviews. SVR is the farthest distance one can see a dark object against a light background as measured in kilometers or miles; higher values are better. Conversely, each change in deciview is roughly equivalent to a just noticeable change in visibility; higher deciview values indicate hazier conditions while lower values are clearer. The Regional Haze Rule established a uniform rate of progress, also called a glide slope, for each Class I Area to measure if enough progress is being made to meet natural background conditions. For ease of understanding, visibility improvements in terms of SVR are given here.

Figure 4 shows the improvement in SVR on the worst visibility days from baseline to current conditions, as well as the uniform rate of progress and the natural background goal in terms of SVR.

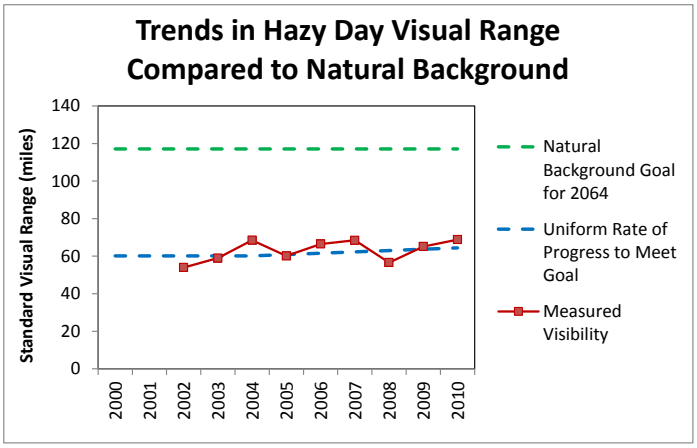

Figure 4: Changes in Visibility as Compared to Uniform Rate of Progress and Natural Background Goal at White Mountain

SVR improved approximately 5% from 2000 to 2009 at White Mountain Wilderness. Figure 5 gives an idea of what this improvement looks like.

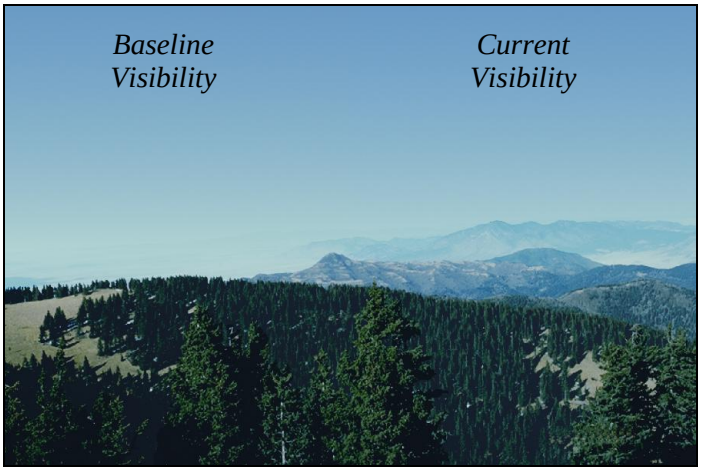

Figure 5: Computer Generated Approximation of the Visibility Improvement at White Mountain Wilderness Area

Are We on Track to Meet Natural Background?

The blue dotted line in Figure 4 shows the glide slope to meet natural background conditions by 2064. Based on the most recent measured visibility, White Mountain Wilderness Area is experiencing improvements in regional haze, but not at the uniform rate of progress required to meet natural background conditions by 2064. Many emission reductions that are required as part of the Regional Haze SIP process will occur over the next several years, so more significant improvements in visibility should be seen in the next decade.

For More Information

Malm, W. (1999). *Introduction to Visibility*. Retrieved from http://www.epa.gov/visibility/pdfs/introvis.pdf

Moore, T. and S. Copeland (2011). *RHR Progress Tracking Metrics.* Retrieved from http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter9.pdf

IMPROVE Website http://vista.cira.colostate.edu/improve/Default.htm