VISIBILITY RESEARCH AT BRYCE CANYON

Rapidly expanding industrialization and energy development throughout the Southwest has led to varying degrees of visibility impairment affecting many of the scenic wonders in the region. The National Park Service in co-operation with the Environmental Protection Agency has recently initiated a program designed to establish the visual air quality in various national parks and monuments. This program will provide the scientific data needed to determine the effects that the interrelated forces of man and nature have on visibility. Today's "baseline" visibility can then be compared to that which will exist in future years.

The 1977 Clean Air Act Amendments declare as a national goal "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas" (Bryce Canyon is such an area), "where impairment results from man-made air pollution". Visibility represents one of the most important aspects of air quality in such parks as Bryce Canyon, Zion, and Grand Canyon where rich colors and endless vistas play such valuable roles. Visibility depends on the concentration of man-made sulfur compounds and fine particulate concentration as well as natural aspects such as the size and color of the distant object, the distance of that object, the angle of the sun, and, of course, the nature of the human eye. Much more pleasure seems to be derived in seeing a distant mountain standout clearly against its surroundings as opposed to a vague image of that mountain with little contrast between it and the sky.

Multiwavelength contrast telephotometers measure visibility in a way that takes into account the details of the distant object. These instruments simply measure the light reaching the detector from a specific target. As such, they "see" like the human eye and include the effects of target properties (color, size, etc...), sun angle, quality of the air, and wavelength of light. Only this type of instrument "sees" the target and measures the color and brightness of the target, as well as its contrast with the sky. This ability is critical to the measurement of color changes or discoloration caused by changes in sun angle or air quality. Contrast telephotometers form an integral part of the visibility study.

Here at Bryce Canyon we also have a nephelometer, an instrument that measures the amount of light scattered by airborne particles. The amount of light scattered is a function of the wavelength of light, the size of the particles and the density of particles. A significant reduction in visibility occurs whenever there is a large amount of airborne particles whose diameters approximate the wavelength of visible light. Commonly, most particles in this size range are associated with oxidation processes (i.e., auto exhaust, coal burning plants, smelter activities, etc.). Larger particles like dusts or water droplets also reduce visibility, but their impact per unit mass is less significant. By measuring the amount of light scattered by an air sample, the approximate reduction in air clarity can be established.

As you visit the viewpoints at Bryce Canyon, notice the degree of visibility in the various directions. To the southeast, 85 air miles distant, lies Page, Arizona, and the coal burning Navajo Power Plant. More of these plants, as well as the associated mining operations are proposed for this area. This includes a major strip mining operation, the Alton coal mine, just to the south of the park only four miles from Yovimpa Point.

This study will aid in the determination of the effects of proposed and existing developments on visibility.