



Mesa Verde  
National Park  
Colorado 81330



## ARE THE RUINS DETERIORATING BECAUSE OF AIR POLLUTION?

Fumes from automobiles and industrial plants may be increasing the acidity of the air and rain. Acids in the air and rain at Mesa Verde may be accelerating the deterioration of the sandstone blocks used by the Anasazi to build their villages.

The metal tower at the south end of Spruce Tree House is part of a pilot research project, funded by the National Park Service, for measuring possible impacts of air pollution of the Mesa Verde ruins. The site includes instruments for monitoring weather conditions and air chemistry. Readings are continuously made of air temperature, relative humidity, horizontal and vertical wind velocity, wind direction, solar radiation, and precipitation. Data on air chemistry, in particular, the concentration of sulfate-containing particles and levels of nitrates and sulfur dioxide, are collected. Air is drawn through the inverted white funnels where filters trap sulfates, nitrates, nitric acid, and sulfur dioxide. These filters are collected each week and sent to laboratories at the University of Illinois for analysis. In addition, a monitoring site at another location in the Park provides data on the chemical composition and acidity of rain at Mesa Verde.

The second major effort of this project involves measuring the rate of deterioration of sandstone. The sandstone used to build the ruins contains quartz grains which are bonded together by a natural cementing material. Over time, rain, snow and dew dissolve the cement. The quartz grains on the sandstone can then be removed by wind and rain, a process which may be accelerated by the chemical attack of acidic air pollutants.

Two test walls were built by researchers from Arizona State University. They contain different types of sandstone used by the Anasazi. One is exposed to rain while the other is protected by a cliff overhang. Very precise measurements, using microphotography, are made of these wall surfaces to determine the rate of deterioration. Also, the temperature and moistness of the sandstone are continuously measured.

The chemistry of the air and rain is then compared with the changing chemistry of the sandstone surfaces to determine if there is a correlation between the levels of air pollution and the rate of sandstone deterioration. However, present monitoring efforts must be continued for several more years before enough data are available for statistically analyzing the possible effects of air quality on the deterioration of the ruins.