

RESEARCH ACTIVITIES

Many studies in air and water quality are underway. This section presents some of the more important or pressing investigations. Since many of these are part of or relate to the National Acid Precipitation Assessment Program (NAPAP), a description of that program is in order. The program is organized into seven task groups: Emissions and Controls, Atmospheric Chemistry, Atmospheric Transport*, Atmospheric Deposition and Air Quality*, Aquatic Effects*, Terrestrial Effects*, and Materials Effects*. The Park Service is importantly involved with five of these (marked with asterisks).

The task groups on Atmospheric Chemistry, Atmospheric Transport, and Atmospheric Deposition and Air Quality seek to provide more credible scientific statements of how a specific source or set of sources contributes to the deposition in a given downwind region. Mathematical models exist to account for gross atmospheric transport, transformation, and deposition. The task groups are working on incorporating more realistic and definitive descriptions of all three processes into more sophisticated models. Empirical studies are underway both to test the models and to learn more about the processes.

The specific goals of the Task Group on Atmospheric Deposition and Air Quality are to 1) determine the spatial and temporal variations in the composition of atmospheric deposition within the U.S. through a nationwide monitoring network; 2) develop and improve methods for reliable measurement of wet and dry deposition; and 3) develop information on the composition of largely pollution-free atmospheric deposition through operation of deposition monitoring and research sites at remote locations throughout the world. The principal source of data in the United States is the National Trends Network (NTN), designed by the Task Group. This network of 150 stations includes many in the National Atmospheric Deposition Program (NADP) network begun by the State Agricultural Experiment Stations in 1978. Thirty-two NADP/NTN stations are located in national parks. No practical method exists for the direct routine measurement of dry deposition, which may be as, or even more, important an environmentally damaging factor than wet deposition. Testing of instruments to measure dry deposition is an important part of the Task Group's current work.

The purpose of the Aquatic Effects Task Group research is to quantify, nationwide, the effects of acid deposition on freshwater resources in the U.S. The two main types of effects emphasized are alterations of water quality and impacts on aquatic organisms. In 1985 the program involved the following: National Surface Water Survey (including sites in several national parks), Direct/Delayed Response Project, Investigation of Biological Processes, Human Health Effects Program, Evaluation of Mitigation Strategies, and Watershed Research. In 1986 the goals will emphasize biologically relevant effects and long- and short-term changes in surface water chemistry.

It has become evident that to understand the potential effects of acid deposition on a lake or stream, chemical processes occurring in the surrounding watershed must be considered. The hydrology, soils, geology, vegetation, and air quality of the watershed all are important determinants of the chemical characteristics of surface waters. Therefore, integrated watershed research involving both the Aquatic Effects and Terrestrial Effects task groups is underway.

Several watersheds in national parks are among those being studied.

Research of the Terrestrial Effects Task Group is directed mainly at the response of vegetation to acid deposition and terrestrial-aquatic linkages. The key questions are: 1) What are the effects of atmospheric deposition on forest structure and function, and how is the response related to soil, biotic, and climatic factors? and 2) How does the terrestrial system alter the deposition chemistry as precipitation flows to ground water, streams, and lakes? The recent decline of certain forest types in the eastern United States adds urgency to these questions. The watershed projects in national parks are among those seeking answers, as is a regional cooperative study in the southern Appalachians, described in the section, Terrestrial Effects of Air Pollution. Also described there are some related findings from the NPS Air Quality Division Biological Effects Program.

The Task Group on Materials Effects seeks to answer five key research questions:

1) What roles do acid deposition and its precursors play in materials degradation relative to other natural and anthropogenic damage agents? 2) What is the rate of damage to specific materials as a function of specific pollutant levels? 3) What is the geographic distribution of susceptible materials? 4) What is the economic value of materials damage? 5) What protection and mitigation strategies are feasible? National Park Service participation in this work is described under Materials Effects of Air Pollution, below.

The NPS representatives on NAPAP task groups are:

Atmospheric Transport: Donald Henderson, Air Quality Division, Denver, Colorado

Atmospheric Deposition and Air Quality: Dr. William Malm, Air Quality Division, Ft. Collins, Colorado

Terrestrial Effects: Dr. Peter White, CPSU, University of Tennessee

Aquatic Effects: Dr. Gary Larson, CPSU, Oregon State University

Materials Effects: Susan Sherwood, Preservation Assistance Division, Washington, D.C.