

THE NATIONAL PARK SERVICE AND ENVIRONMENTAL QUALITY—AN OVERVIEW



An ozone-injured Jeffrey pine in Sequoia/Kings Canyon NPs contrasts with a healthy, ozone-tolerant specimen in the background.

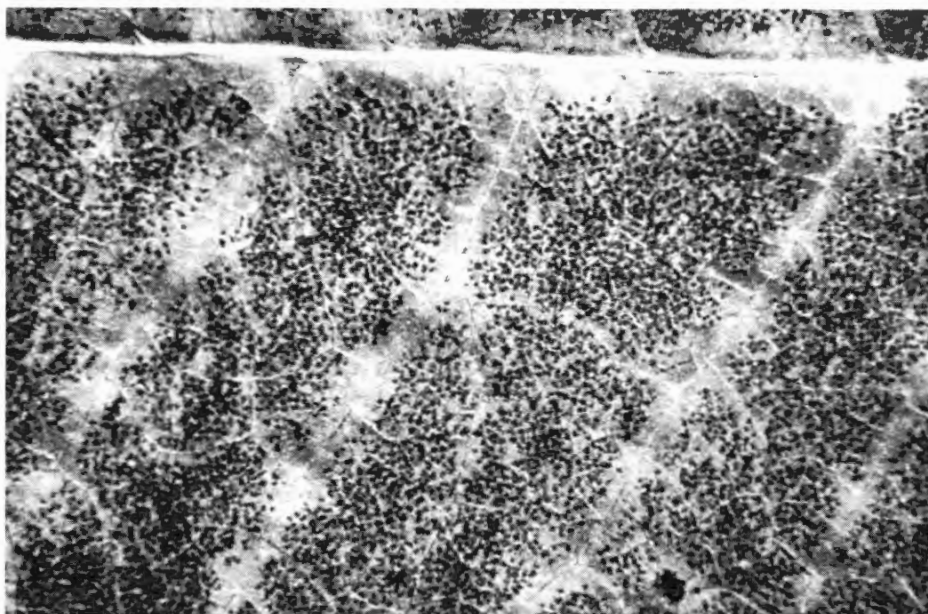
The following preamble to this report briefly describes the ways the National Park Service addresses pollution problems. Subsequent sections discuss current regulations, research activities, situations at specific parks, and other information of interest to those involved with environmental quality in the National Park System.

A Bit of History

Pollution, as might be expected, became a major concern in the natural national parks later than in more developed parts of the country. Chicago passed a smoke ordinance as early as 1881, to be followed by other large cities in the next few decades. The first serious Los Angeles "smog" to attract public attention occurred in 1943. In the mid-1950s, acidic (low pH) precipitation was reported in the northeastern U.S. Environmental concern grew enormously during the 1960s, perhaps stirred most strongly by Rachel Carson's indictment of pesticides in *Silent Spring*, published in 1962. Burning chemicals on the surface of the Cuyahoga River, and a "dying" Lake Erie symbolized the seriousness of water pollution.

Among major governmental responses to these problems were the Clean Air Act of 1963 (particularly as amended in 1970 and 1977), the National Environmental Policy Act of 1969, creation of the Environmental Protection Agency in 1970, and the Water Pollution Control Act of 1972. Yet at the beginning of the 1970s, pollution still did not rank high as a worry for park managers. In William Everhart's book, *The National Park Service*, published in 1972, the only reference to such problems was mention of agricultural pesticides in water flowing into the Everglades. Instead, attention was focused mainly on handling the pressure of rising visitation.

But this situation changed dramatically during the ensuing years. The 1969 annual report of the Office of Natural Science Studies listed only four studies of pollution in the park system (three on pesticides, one on water quality). The (unpublished) report for 1977, by contrast, listed 48 (28 on water quality, 14 on air quality, 3 on pesticides, and 3 on radiation). This Systemwide annual report was discontinued the following year, but some regions produce such a listing. In 1984, in just three of the ten regions—Mid-Atlantic, Midwest, and Pacific Northwest—a total of 93 projects dealing with environmental quality were listed (64 on air quality, 26 on water quality, 1 on pesticides, 1 on "ecotoxicity," and 1 on toxic waste). Among the ten threatened resources reported most frequently in *State of the Parks, 1980*, air quality ranked second (140 parks) and fresh water quality ranked fifth (130 parks). Air pollution injury to vegetation, acidification of lakes and streams from acid precipitation, and visibility impairment have become widespread concerns in the national parks.



Black spots on this close-up of a common milkweed leaf indicate ozone injury. Milkweed plots have been established in many national parks to monitor ozone effects.

Waste from outside sources poses a threat to surface and ground water quality in many park units. Deterioration of cultural resources from exposure to air pollution is a long-standing, but only recently publicized, problem in many urban parks and even some rural areas.

Organizational Responsibilities

The National Park Service deals with pollution at the national, regional, and park levels. The principal national offices involved are the Air Quality Division, the Water Resources Division, the Preservation Assistance Division (Cultural Resources), and the Engineering and Safety Services Division (Maintenance). At the regional level, air quality and water resources coordinators provide liaison between the national offices and field units. Regional Chief Scientists administer some of the monitoring of air and water quality conducted in specific parks. A few parks, such as Great Smoky Mountains, Sequoia-Kings Canyon, and Olympic, have staff scientists engaged in research on environmental quality, but most such research is conducted through contracts, by Air Quality and Water Resources personnel, or by institutions not funded by NPS. Park staff members carry out most of the ongoing meteorological and pollutant monitoring.

Mitigating pollution problems that arise within parks is primarily the responsibility of park managers and maintenance staffs, with assistance from the regional or national office if necessary. Addressing problems that originate outside parks often re-

quires cooperation among all levels of the Park Service and relevant Federal, State, and local agencies.

Air Quality Division

An Air and Water Quality Division was created in the Washington office in 1978 and later was split into two divisions. The Air Quality Division has a professional staff of eighteen people, most of whom are in Denver, with small units in Fort Collins, Colorado, and Washington, D.C. It administers four major technical programs:

- 1) The Division has been monitoring air quality and visibility in units of the National Park System since 1978. The present monitoring program involves sulfur dioxide monitors at 11 parks, ozone monitors at 19 parks, total suspended particulate monitors at 16 parks, nitrogen dioxide monitors at two parks, a hydrogen sulfide monitor at one park, fine particulate monitors for visibility at 30 parks, teleradiometers for visibility at 29 parks, and cameras for visibility at 36 parks. In FY 1986, air quality monitoring, including visibility, fine particulate matter, gaseous pollutants, and meteorological monitoring, will be initiated in nine additional parks.

- 2) In 1982, the Air Quality Division launched a major Biological Effects Program to study the effects of air pollution on vegetation. The program includes air pollution effects surveys, sensitivity screenings, trace element surveys, and ecological surveys, with activities in FY 86 in over 60 parks. Pollutant fumigation studies have also been performed to determine levels at which various species are sensitive to air pollutants. Injury to vegetation, especially from ozone and sulfur dioxide, has been documented in almost 40 parks. Lichens,

which are especially sensitive to air pollution, have completely disappeared from parts of some parks. Fumigation studies on quaking aspen genotypes from polluted and non-polluted regions indicate that sensitive genotypes in the more polluted regions are disappearing.

- 3) Since 1979, the Division has been reviewing permit applications for proposed new facilities that might affect class I parks, which, under the Clean Air Act definition, includes most national parks over 6,000 acres in size and most wilderness areas over 5000 acres, except for the new areas in Alaska. The state in which the proposed project would be located makes the final decision on the permit application, which may be denied if the NPS demonstrates that an adverse impact on park resources would occur. The Division has reviewed permit applications for more than 100 proposed projects. Under a Memorandum of Understanding (MOU) with the Fish and Wildlife Service (FWS), the Division also reviews permit applications affecting FWS areas. To date, 34 applications have been reviewed under this MOU.

- 4) Also since 1979, the Air Quality Division has been applying and developing various mathematical models for tracing and predicting the movement and concentration levels of air pollution. Because sulfates are especially important contributors to visibility impairment, and are an important component of acid deposition, the Division has developed both diagnostic and prognostic long-range transport models to estimate sulfur dioxide and sulfate concentrations. To date the models have been successfully applied to much of the eastern United States, including Shenandoah, Acadia, Great Smoky Mountains, and Mammoth Cave national parks. Because of the observed effects of ozone on natural vegetation, similar model development is underway to identify source regions that contribute to ozone levels in park units.

The Division also integrates air resources management into Service operations and planning, develops interpretive materials for park use, and participates with Federal, State, and local agencies in developing regulatory programs.

Water Resources Division

The Water Resources Division, with 21 professionals, many of whom deal with water quality, has three units in Fort Collins, Colorado, one in Denver, and one staff member in Washington, D.C. Of the five principal issues the Division deals with, two involve water quality: identification and mitigation of external and internal influences on park water quality and quantity; and location of potable water supplies.

About half of the Division's projects are concerned entirely or partly with water quality. Much of the work is assessing water quality or setting up long-term

monitoring programs. Water quality is a constant concern in the park system, especially as it is affected by external influences. Inadequate waste water treatment by municipalities and industrial plants, acid mine drainage, and toxic waste are some of the major causes of water pollution in parks. A large study of irrigation drainage, sparked by selenium damage in a national wildlife refuge in California, has been launched by the Department of the Interior. Such toxic drainage may be affecting units of the National Park System as well.

Acid Deposition Research

NPS research on acidic deposition is administered by the Office of Natural Resources and the Preservation Assistance Division in Washington, D.C. It is conducted as part of the National Acid Precipitation Assessment Program (NAPAP), a 10-year, federally sponsored program to study causes and effects of acid deposition and to recommend actions to be taken. The NPS is one of 12 Federal agencies and four National Laboratories in the program. National Park Service personnel at the national, regional, and park levels are involved. Park Service work has focused on deposition monitoring and integrated watershed studies. The Service, in cooperation with the U.S. Geological Survey, Bureau of Land Management, National Oceanic and Atmospheric Administration, and state agencies, is conducting long-term monitoring of the chemistry of wet atmospheric deposition at 32 park sites, part of the 150 sites currently in the National Atmospheric Deposition Program/National Trends Network. Integrated watershed research is underway in five parks—Isle Royale, Rocky Mountain, Sequoia-Kings Canyon, Olympic, and Shenandoah—to learn how atmospheric deposition affects ecosystems.

Effects of acidic deposition on cultural resources of the National Park System are being investigated, also under NAPAP, by the Preservation Assistance Division in Washington. Deterioration of historic materials, particularly marble, limestone, and statuary bronze, is being studied through laboratory research, *in situ* monitoring of cultural resources in parks, and controlled field exposures at several sites selected to represent the range of potentially impacted environments.

Ray Herrmann of the Water Resources Division summarized the situation as follows: "In reference to parks, we can say: 1) Parks are receiving acidic deposition with loadings highest in the east and southeast; 2) there is a potential for irreversible damage to sensitive cultural and natural resources in parks across the country; 3) these effects could be potentially catastrophic for high elevation lake and stream systems, particularly those with salmonid (trout) populations, high elevation boreal forests, and sensitive cultural



A biomonitoring garden, Voyageurs NP. The garden is part of the Minnesota Environmental Board Plot System, which includes biomonitoring gardens throughout the state. Each garden consists of several species of native and crop plants. Biomonitoring studies are used to detect the first signs of air pollution effects on biological resources. Individuals in the photo are harvesting plants for dry weight and trace elements analyses. The NPS has established biomonitoring plots in several NPS units.

resources; and 4) the NPS through its strong tie to the interagency research program will get the needed answers over time." (*Park Science*, Winter 1986).

Engineering and Safety Services Division

Control of environmental pollution originating within parks is generally the responsibility of park maintenance staffs, which manage sewage treatment facilities, solid waste disposal, use of herbicides and pesticides, and other potential sources of pollution. The NPS record in meeting requirements of Federal, State, and local laws on environmental quality is excellent, but it can be argued that standards within parks, which are intended to be maintained in near-pristine condition, should be set even higher than those of the surrounding jurisdictions.

The Branch of Maintenance in the Washington office, a unit of the Engineering and Safety Services Division, has responsibility for Systemwide policy, budgets, guidelines, and planning for maintenance. It is currently conducting an inventory of waste chemicals in parks and investigation of methods for their disposal. It is also responsible for dealing with external hazardous waste situations that affect parks and come under the Resource Conservation and Recovery Act (RCRA—waste from present operations) or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA/Superfund—inactive hazardous waste sites). Some currently identified problems include drums of toxic chemicals that wash

ashore at Padre Island, impacts on Gateway National Recreation Area of toxic wastes from two New York City landfills, and radioactive wastes at a lake near the Appalachian Trail at Paulding, New York.

The Role of Non-NPS Institutions

At some parks, much of the funding for research on pollution problems is provided by non-NPS sources, which find the parks useful sites for answering their research questions. A March 1985 register of completed or ongoing research projects on environmental quality of Great Smoky Mountains National Park listed 103 projects. Of the 77 for which the funding source was recorded, 41 were funded wholly or in part by non-NPS institutions. In terms of total funding amounts, the non-NPS proportion was even larger. Of the 42 acid deposition/ecosystem studies underway in March 1986 in Sequoia National Park, 37 were sponsored wholly or in part by other institutions.

The Outlook

NPS resources devoted to improvement of environmental quality in the parks have been increasing over the past few years. Whether these resources are adequate or whether this trend will continue in the face of general budget cutbacks is uncertain. The problems, however, are likely to be with us for a long time.