

Government Agencies' Need for Data on Ozone Injury to Western Pines

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Since the 1970's, researchers from the USDA Forest Service and USDI National Park Service have conducted field surveys to measure the presence or absence, amount, and changes of ozone-caused injury to ponderosa and Jeffrey pines (Pronos and others 1978, Pronos and Vogler 1981, Stolte and others 1992). However, differences in measurement protocols among studies and the lack of site-specific ozone concentration data have limited the extent that data can be used to project long-term or regional-scale trends. Although the effects of ozone on ponderosa and Jeffrey pines are still an important ecological concern in California, efforts to determine temporal or spatial trends in needle injury and efforts to relate injury to ambient concentrations of ozone would be enhanced if researchers used the same method to quantify amounts of ozone-caused needle injury.

In March 1989 a workshop was held at the Forest Service's Pacific Southwest Research Station, Riverside, California, to discuss Federal land management and State environmental protection agency needs regarding the effects of ozone on western pine tree species. The purpose of the workshop was to develop and document a recommended methodology for measuring ozone injury on pine trees in the western United States. This method would be used to collect quality-assured pine needle injury data. It would meet the needs of the participating organizations to monitor the condition of air quality-related values in class I areas (Forest Service, National Park Service), forest health (Forest Service) or the welfare effects of ozone in California (Air Resources Board). The participants agreed to prepare a document that described the methodology in detail, contained overviews of the effects of ozone on native vegetation, and reported methods or practices used to measure the amount of ozone-caused injury to ponderosa and Jeffrey pines.

Federal land managers (e.g., USDA Forest Service, USDI National Park Service) are responsible for assessing and preventing injury to forest trees and other air quality-related values in wilderness areas, National Parks, and National Monuments (cf. Clean Air Act of 1970, Clean Air Act Amendments of 1977 and 1990). The Clean Air Act Amendments of 1977 ensure that air quality in some regions of the United States, which is cleaner than required by National Ambient Air Quality Standards, would be protected from deterioration in future years. Natural resource areas, such as national wilderness areas and National Parks, were prioritized for protection. Class I areas, characterized by specific areal and formal designation criteria, were afforded the greatest degree of air quality protection (Bunyak 1993).

Air pollutant data showing the effects of ozone on ponderosa and Jeffrey pines are of interest to Federal land managers in California, particularly in the Sierra Nevada and San Bernardino Mountains. Because the harmful effects of ozone on western yellow pines are well-documented (Miller 1989), ozone is still considered by Federal land managers to be a regional-scale ecological stress to air quality-related values in wilderness areas in California (Peterson and others 1993). Pine needle injury-response data are an example of the kind of information Federal land managers may use to evaluate the impacts of current and future exposures to ozone on air quality-related values in their administrative domain.

In the State of California, the Air Resources Board of the California Environmental Protection Agency (Cal EPA) is responsible for planning and implementing air quality-related activities (cf. Title 17, California

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Administrative Code, Section 70101). This Board sponsors research on the causes and effects of air pollutants (Air Resources Board 1993), operates a network of air monitoring stations (e.g., Air Resources Board 1991), and sets policies for controlling pollutant emissions from mobile sources (Air Resources Board 1990). In addition, the Air Resources Board has sponsored research to characterize ozone concentrations in forests on the western slope of the Sierra Nevada (Carroll 1991, 1992) and supported studies to document the adverse ecological effects of air pollutants on ponderosa pine seedlings (Bytnerowicz and Temple 1993). Information on the effects of ozone on ponderosa and Jeffrey pines is considered by Air Resources Board staff when reevaluating the welfare effects component of existing State ambient air quality standards (Stromberg and others 1987).

Rationale for Federal and State Agency Involvement

Federal land managers have the responsibility to protect the air quality-related values in wilderness areas in their jurisdiction from the adverse effects of air pollutants (cf. Organic Act of 1916, Clean Air Act of 1970). Air quality-related values are air pollution-sensitive values (e.g., biological diversity, water quality, vegetation, wildlife) that characterize or define the basis for preserving lands as wilderness areas (Fox and others 1989). The Wilderness Act of 1964 (cf. Public Law 88-557) defines a wilderness as "an area untrammeled by man" and "an area of undeveloped Federal land retaining its primeval character and influence." Air quality-related values in wilderness areas include visibility, flora, fauna, cultural and historical resources, odor, soil, water and virtually all resources that are dependent upon and affected by air quality (Bunyak 1993).

The Clean Air Act Amendments of 1977 authorized Federal land managers to protect air quality-related values in designated wilderness areas from the adverse effects of air pollutants. Sections 160-169A of the Act Amendments established a program for the prevention of significant deterioration (PSD) of air quality. The principal objective of the PSD program is to prevent the degradation of air quality in areas that are in compliance with National Ambient Air Quality Standards, while maintaining a margin for pollutants generated by future emission sources (Peterson and others 1993). To implement the PSD program, Federal land managers review applications for new and modified sources of air pollutants that may impact their administrative domain (e.g., proposed sources within 100 km of a wilderness area).

The review of a PSD application requires Federal land managers to perform a rigorous analysis to: (1) determine which control technology may need to be used to minimize pollutant emissions, (2) estimate the amount of pollution contributed by a proposed project to existing ambient pollution levels, and (3) assess impacts to air quality-related values. On the basis of the findings of their analysis, Federal land managers advise the U.S. Environmental Protection Agency (EPA) or the state permitting authority if emissions from a proposed project may adversely impact a wilderness area (Bunyak 1993).

U.S. Department of Agriculture, Forest Service

In the U.S. Department of Agriculture, the Forest Service has delegated the responsibility to review PSD applications to its nine regional offices. For example, PSD applications in California are reviewed by staff in the Pacific Southwest Region, headquartered in San Francisco, California. The Pacific Southwest Region is also responsible for reviewing applications submitted in Hawaii, Guam and other islands with Trust Territory status. In addition to the PSD program, the Pacific Southwest Region of the Forest Service also conducts

research on the long-term effects of air pollutants on vegetation in the western United States (Miller 1989). Ozone injury surveys have been conducted since the 1960's in the San Bernardino Mountains (Miller and Millecan, 1971) and since the 1970's in the Sierra Nevada (Pronos and others 1978).

U.S. Department of the Interior, National Park Service, Air Quality Division

In the U. S. Department of the Interior, the National Park Service, Air Quality Division reviews PSD applications for the National Park Service. Because clean air is fundamental to visitor enjoyment, environmental quality, scenic vistas and the preservation of natural and cultural resources in National Parks and wilderness areas, the National Park Service has incorporated air resource management into park operations and planning. In support of its resource management goals, the National Park Service has also sponsored ambient ozone monitoring and research in some National Parks where ozone-caused injury to ponderosa and Jeffrey pines has been observed (Patterson and Rundel 1990). Currently, the National Park Service continues its efforts to identify symptoms of air pollution injury, examine the mechanistic basis of air pollution injury, and understand its significance to individual species and plant communities.

State Environmental Protection Agencies— California Air Resources Board

National Ambient Air Quality Standards are established by the U.S. Environmental Protection Agency to protect human health and welfare from the harmful effects of air pollutants on a national-scale. However, because of the severity of the air pollution problem in California, more stringent state ambient air quality standards have been adopted for selected criteria air pollutants, including ozone. The Air Resources Board (ARB) of California re-examines the technical basis for existing air quality standards (Stromberg and others 1987), sponsors research projects to investigate the causes and effects of a variety of air pollutants (Air Resources Board 1993), operates extensive criteria and toxic air pollution monitoring programs (Air Resources Board, 1991), develops rules/regulations to control pollutant emissions from motor vehicles (Air Resources Board 1990), and works with regional and local air quality management districts to attain and maintain state ambient air quality standards.

Summary

The effects of ambient concentrations of air pollutants on the health of forest trees is of concern to Federal land management and State environmental protection agencies. In California, ponderosa and Jeffrey pines are an important air quality-related value, as they are known to be sensitive to elevated concentrations of ozone. Data from field surveys to assess ozone-caused needle injury on ponderosa and Jeffrey pines, combined with quality-assured ozone concentration data from government agency-funded research and air monitoring programs, collectively provide valuable information for decision-makers concerned with forest ecosystem management and/or regulating sources of air pollutants in California. Quality-assured ozone concentration and pine needle injury response data are needed by Federal land managers to review PSD applications for new and modified sources that may impact wilderness areas, and by environmental protection agencies to evaluate the welfare effects of ozone in examining the basis for new or existing ambient air quality standards.

