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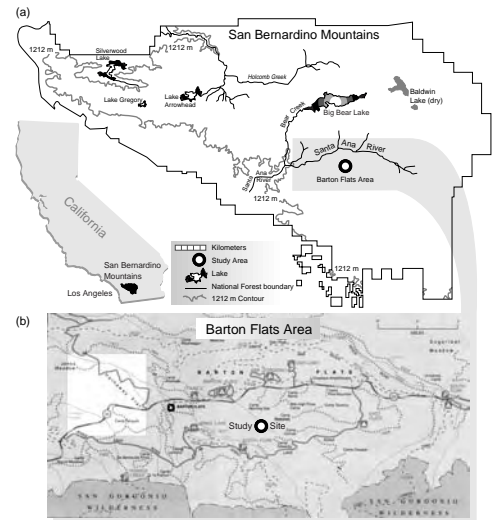
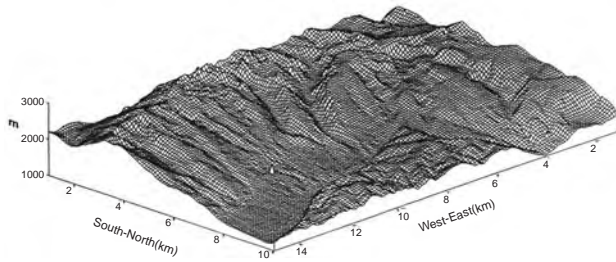
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Proceedings of the International Symposium on Air Pollution and Climate Change Effects on Forest Ecosystems

February 5-9, 1996

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Abstract

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The purpose of the International Symposium on Air Pollution and Climate Change Effects on Forest Ecosystems held February 5-9, 1996 in Riverside, California, was to summarize results of several years of scientific collaboration between the United States and European specialists about air pollution and climate change effects in Central European and North American forests. More than 40 technical presentations given by scientists and forest managers from the United States and Central Europe were divided into 5 sessions discussing mechanisms of air pollution and climate change effects on plants; air pollution status of forests; results from several gradient and case studies on the effects of air pollution/climate change on forests; information on forest health in several Central European countries; and information regarding photosynthetic active radiation measurements and their use in forest health monitoring.

Retrieval Terms: effects on forests, monitoring, nitrogen deposition, ozone, sulfur dioxide

Technical Coordinators

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Proceedings of the International Symposium on Air Pollution and Climate Change Effects on Forest Ecosystems

February 5-9, 1996 Riverside, California

Andrzej Bytnerowicz Michael J. Arbaugh Susan L. Schilling
Technical Coordinators

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Preface

Industrial air pollution has been identified as one of the primary causes of severe damage to forests of central Europe in the past 30 to 40 years. The mountain forest ecosystems have been affected considerably, resulting in extensive areas of severely deteriorated forest stands (e.g., the Krusne Hory of the Czech Republic or the Izerske and Sudety Mountains along the Polish and Czech border). In addition, the increase of motor vehicles in central Europe has caused a higher amount of nitrogen oxide and hydrocarbon emissions. Under particular weather conditions (high solar radiation, high temperatures, temperature inversions), these compounds may undergo complex chemical transformations resulting in the formation of photochemical smog and a build-up of potentially phytotoxic ozone concentrations. Ozone has already been responsible for injury to ponderosa pine stands in the San Bernardino Mountains in southern California and to forest vegetation in the eastern United States and western Europe. Elevated concentrations of nitrogenous components in photochemical smog and the emissions of ammonia from agricultural activities have caused eutrophication of natural ecosystems, including forests, both in Europe and North America. In addition, changing climatic factors, especially the amount of precipitation, temperature and solar radiation (including ultraviolet-B), modify responses of plants to air pollution, and must be considered when these effects are evaluated.

To successfully prevent additional deterioration of forest health both in central Europe and in the United States, well-coordinated research activities are needed in the areas of air pollution and forest health monitoring, investigations of the effects of air pollution and climate change on forest functioning, and selection and implementation of proper response strategies. These studies may result in stricter air pollution standards in the forested areas and more effective control strategies. Reduction of air pollution and the simultaneous improvement in understanding forest functioning and the application of research results should help prevent future forest decline and rebuild the already damaged forests. Cleaner air also results in the preservation of valuable biological resources and healthier living conditions of people.

Since 1991, U.S. agencies such as the USDA Forest Service (FS), USDA International Cooperation and Development (ICD), and U.S. Environmental Protection Agency (EPA), and the European institutions such as the Polish Academy of Sciences have sponsored a collaborative scientific program entitled "The Effects of Atmospheric Deposition and Climate Change on Forest Ecosystems in Central and Eastern Europe and the United States." This program has resulted in several cooperative studies between U.S. and Polish scientists, introduced the European cooperators to the forest health monitoring procedures used in the U.S., and provided training in using plants as bioindicators of air pollution phytotoxicity. Other cooperative studies, sponsored mainly by the FS, ICD, and European institutions, have been conducted in Bulgaria, Poland, the Czech Republic, and Ukraine. Thanks to the financial support provided by the U.S. State Department, FS, and EPA, and governments of the European countries, the European participants have received advanced training in the U.S. Forest Health Monitoring methodologies, and selected countries have implemented this system. In addition, funds received from the USDA FS Pacific Global Change Research Program and the Southern California Edison Company made possible collaborative research between Polish, U.S., and Canadian scientists on the effects of elevated levels of nitric acid vapor (an important component of photochemical smog) on California tree species.

Partial presentation of the developing plans for this cooperative research and some of the preliminary results were presented at the international conference "Climate and Atmospheric Deposition Studies in Forests" organized by the Polish Academy of Sciences and the USDA Forest Service in October 1992 in Nieborow, Poland. In addition, at the Nieborow meeting, Ann Bartuska of the FS suggested that the Pacific Southwest Research Station, USDA FS organize an international symposium in Riverside, California in 1995/1996. The purpose of such a meeting would be to present and discuss the continuing progress of the U.S.-European research cooperation.

Thanks to the financial support of the USDA ICD, the USDA FS, and a grant from the Southern California Edison, the International Symposium on Air Pollution and Climate Change Effects of Forest Ecosystem was held in the recently renovated historic Mission Inn in downtown Riverside on February 5-9, 1996. The primary goal of the meeting was to discuss the effects of air pollution and climate change and modification of these effects by other abiotic and biotic factors on forest ecosystems. Seventy scientists, forest managers, and decision makers from Belarus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Russia, Slovakia, Ukraine and the United States participated in the meeting.

The participants of the symposium were greeted by the Mayor of the City of Riverside, Ronald Loveridge, who is also a member of the South Coast Air Quality Management District, and James Space, Director of the Pacific Southwest Research Station, USDA Forest Service. In his opening remarks James Space stated, "The issues of global climate change and human-made air pollution are closely intertwined and have been the subject of major inter-governmental research programs, both locally and worldwide. The implications are vital to the long-term sustainability of our forest ecosystems." William T. Sommers, Director of the Forest Fire and Atmospheric Sciences Research Staff, USDA Forest Service, outlined the domestic and international activities of the FS related to air pollution and climate change effects on forests and the U.S. forest health monitoring activities. Whetten Reed, Director of the USDA International Cooperation and Development, discussed international cooperative research sponsored by the USDA in central and eastern Europe.

These introductory speeches were followed by five scientific sessions in which more than 40 papers by European and U.S. forest scientists and managers were presented. Session 1 included the mechanisms of the effects of oxidant air pollutants on plants, the use of plants as bioindicators of air pollutants, and the effects of air pollution and climatic factors on mountain forests of southern Poland and the San Bernardino Mountains and Sierra Nevada of California. At Session 2 papers were presented on air pollution status in European and U.S. forest sites, effects of fire on the Siberian boreal forests, and deposition of nitrogen air pollutants to forests and its effects on the health and ecology of natural ecosystems. At Session 3 the results of case studies addressing air pollution and climate change on forests, both in Europe and the United States, were discussed. Session 4 included information on the status of forests in the individual countries, based on the results from the Forest Health Monitoring networks. Session 5 dealt with measurements of photosynthetic active radiation (PAR) and its use for forest health monitoring efforts; and a video, "Integrating Remote Sensing with GIS," produced by the USDA FS, was shown. In general, the meeting provided an update on forest health and air pollution status in forests, mechanisms of air pollution and climate change on forest vegetation, and an evaluation of the possible ecological effects of air pollution and climatic factors in forests of the represented countries.

After 2 days of sessions, three field trips were offered to the symposium participants: (1) in the San Bernardino National Forest and Joshua Tree National

Park in California, the air pollution monitoring efforts, effects of air pollution on natural resources of forest and desert ecosystems, and programs that involve school children in nature preservation were presented; (2) at the Harry Reid Center for Environmental Studies, University of Nevada, Las Vegas, software used for forest health monitoring activities in the United States and some of the central European countries was demonstrated, and the participants received hands-on training of the presented methodologies; and (3) at the Pacific Southwest Research Station, USDA FS in Riverside visitors were acquainted with scientific activities related to the effects of air pollution and climate change on forests, various aspects of research and management related to fire presence in forests, meteorology and fire severity forecasting, and wildland recreation and the urban culture research, and visited the Botanic Garden of the University of California, Riverside and natural history collections of the Riverside Municipal Museum.

Future research cooperation between the U.S. researchers and their European colleagues may include climatic gradient studies in Poland, Belarus, and Russia or cooperation between the Czech Republic, Poland, Slovakia, Ukraine and the United States on ozone distribution studies and phytotoxicity in forests of the Carpathian Mountains. In addition, a similar meeting may be organized in a few of years in one of the European countries to discuss and evaluate progress of the ongoing cooperative work.

The Organizing Committee for the Symposium on February 5-9, 1996 consisted of Alicja Breymeyer, Polish Academy of Sciences; Andrzej Bytnerowicz, USDA Forest Service; William Manning, University of Massachusetts; and Reginald Noble, Bowling Green State University. The Local Arrangements Committee consisted of Michael Arbaugh, Linda Burkholder, Andrzej Bytnerowicz, Paul Miller, Mark Poth and Susan Schilling, Pacific Southwest Research Station, USDA Forest Service.

Andrzej Bytnerowicz,
Technical Coordinator