State of California
AIR RESOURCES BOARD

Resolution 82-44

August 25, 1982

Agenda Item No: 82-16-3b(1)

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 1159-94 entitled "Effects of Acid Rain on Plant-Microbial Associations in California: (a) The Influence on Mycorrhiza and Legume Growth; and (b) The Field Study of Acid Rain Effects on Soil and Vegetation" has been submitted by the University of California, Berkeley, to the Air Resources Board; and

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 1159-94 entitled "Effects of Acid Rain on Plant-Microbial Associations in California: (a) The Influence on Mycorrhiza and Legume Growth; and (b) The Field Study of Acid Rain Effects on Soil and Vegetation" submitted by the University of California, Berkeley, for an amount not to exceed $83,524;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 1159-94 entitled "Effects of Acid Rain on Plant-Microbial Associations in California: (a) The Influence on Mycorrhiza and Legume Growth; and (b) The Field Study of Acid Rain Effects on Soil and Vegetation" submitted by the University of California, Berkeley, for an amount not to exceed $83,524.

BE FURTHER RESOLVED, that the Executive Officer is authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $83,524.

I certify that the above is a true and correct copy of Resolution 82-44 as passed by the Air Resources Board.

Harold Holmes

Harold Holmes, Board Secretary

State of California
AIR RESOURCES BOARD

Agenda Item No: 82-16-3b(1)
Date: August 25, 1982

ITEM: Research Proposal No. 1159-94 entitled "Effects of Acid Rain on Plant-Microbial Associations in California: (a) The Influence on Mycorrhiza and Legume Growth; and (b) The Field Study of Acid Rain Effects on Soil and Vegetation".

RECOMMENDATION: Adopt Resolution 82-44 approving Research Proposal No. 1159-94 for funding in an amount not to exceed $83,524.

SUMMARY: The damage that acid precipitation causes to aquatic ecosystems has been documented in Scandinavia and Eastern North America. The Air Resources Board has sponsored research showing that acid precipitaton occurs widely in California and that soils and vegetation face potential adverse effects from acid precipitation. The nature of these effects and the important question of reversibility have not yet been studied.

Acid precipitation may adversely affect beneficial microbial processes such as nitrogen fixation and nutrient mobilization. Nitrogen and phosphorus are supplied to many plants through symbiotic relationships between mycorrhizal fungi and bacteria. Such plants supply energy to the microbes and the microbes supply phosphorus, nitrogen or other nutrients in a form usable to the plants. These symbiotic relationships are very important sources of nutrients to plants, especially forest and range plants. Serious consequences to ecosystems can result through reduced growth and ability of the plant to compete for nutrients if acid deposition interferes with the symbiosis.

California has within its borders examples of the devastating effects of acid and metallic deposition on vegetation and soils. A metal smelter operated near Redding from 1905-1919 caused deforestation and subsequent severe erosion downwind from the operation. Even today, this area is in various stages of recovery and could yield valuable information about long term effects of acid deposition on vegetation and soil. The proponent plans to coordinate laboratory and greenhouse studies with field studies near the smelter to determine the effects of acid deposition on important plant-microbe relationships.

The first part of the proposal is concerned with laboratory and greenhouse studies on the effect of acid precipitation

on the relationship of mycorrhizal fungi to two grasses, clover and soft chess. These plants are already being exposed to simulated acid rain by Drs. John McColl and Mary Firestone under an existing ARB contract. The proponent would also use lupine to investigate carbon flow and nutrient mobility between the plant and mycorrhizal fungi and rhizobia bacteria as they are affected by simulated acid precipitation. Plant growth as well as the extent of mycorrhizal infection, rate of nitrogen fixation, soil pH and the concentration of manganese and aluminum in the soil available to the plant will be recorded.

The second part of the proposal consists of a field study of the soil and vegetation and the fungi and bacteria associated with the plant roots in the area around the smelter near Redding. Field sites will be chosen along the gradient of smelter effects, from the most heavily impacted out to areas that were never impacted. A survey of vegetation occurring over the range of severity of smelter effects will be carried out. Vegetation will be analyzed for the elements, nitrogen, phosphorus, manganese, iron, zinc, nickel, calcium, magnesium, sulfur and copper. Soils will be analyzed for pH, cation exchange capacity, organic matter, microbial biomass and the elements nitrogen, phosphorus, copper, zinc and manganese. The extent of infection of plant roots by mycorrhizal fungi as well as the types of fungi present will be determined. Results of the laboratory and greenhouse studies will be compared with field observations to elucidate the mechanisms by which acid deposition affects soil and vegetation-microbe relationships.

The proposed work will provide valuable information to the ARB for assessing the impact of acid deposition on California soil-plant-microbe systems. The study would extend our knowledge in two areas: 1) the potential long term effect of acid deposition on soil and its reversibility; and 2) the effects of acid deposition on important plant-microbe relationships.

State of California
AIR RESOURCES BOARD

Resolution 82-45

August 25, 1982

Agenda Item No.: 82-16-3b(2)

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 1160-94 entitled "Development of Methods to Estimate the Benefits of Visibility Improvement" has been submitted by the Santa Fe Research Corporation to the Air Resources Board; and

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 1160-94 entitled "Development of Methods to Estimate the Benefits of Visibility Improvement" submitted by Santa Fe Research Corporation, for a total amount not to exceed $54,783;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 1160-94 entitled "Development of Methods to Estimate the Benefits of Visibility Improvement" submitted by Santa Fe Research Corporation, for a total amount not to exceed $54,783;

BE IT FURTHER RESOLVED, that the Executive Officer is authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed $54,783.

I certify that the above is a true and correct copy of Resolution 82-45 as passed by the Air Resources Board.

Harold Holmes

Harold Holmes, Board Secretary

State of California
AIR RESOURCES BOARD

Agenda Item No.: 82-16-3b(2)
Date: August 25, 1982

ITEM: Research Proposal Number 1160-94 entitled "Development of Methods to Estimate the Benefits of Visibility Improvement"

RECOMMENDATION: Adopt Resolution 82-45 approving Research Proposal Number 1160-94, for funding in an amount not to exceed $54,783.

SUMMARY: This research project will provide estimates of the current cost of visibility degradation and the potential benefits of visibility improvement. Recent air quality benefit studies suggest that visibility degradation may be one of the greatest costs of air pollution; however these studies have not provided a methodology to estimate visibility benefits on a systematic basis. The objective of this project is to develop systematic procedures for use in assessing the benefits of improved visibility.

The procedures for estimating visibility benefits will be based on an analysis of the relationship between housing values (sales prices) and measured visibility. Spatially detailed data sets for four Los Angeles area counties and for five San Francisco area counties covering two time periods, 1973-74 and 1978-79, will be used to develop the relationships for the analysis.

Task 1 of the proposed project will assemble, process and organize data for four visibility indices in a format consistent with the data for housing values and various market parameters. Task 2 will derive, test, and correct statistical relationships between housing values, visibility indices, and various other factors. Task 3 will formulate and apply an economic procedure for estimating visibility benefits based on the statistical relationships.

The project is very cost-effective, in that it represents a synthesis of visibility research previously conducted by SFRC with housing value data previously organized by the project economists. This synthesis will permit analysis to be performed on bountiful and detailed data sets at relatively little cost.