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Acidic Deposition: State of Science and Technology

Summary Report of the U.S. National Acid Precipitation Assessment Program

Acidic Deposition: State of Science and Technology

Summary Report of the U.S. National Acid Precipitation Assessment Program

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PREFACE

The twenty-seven State-of-Science and State-of-Technology (SOS/T) Reports, published in 1990 as the definitive scientific and technical synthesis of information obtained during the first decade of the U.S. National Acid Precipitation Assessment Program (NAPAP), are summarized in this document. In most cases, these summaries were the final chapter of the complete SOS/T Report.

The material reviewed in the SOS/T series represents a comprehensive survey of relevant technical information from all sources about the causes, effects, and control of acidic deposition and associated pollutants. The scope includes (1) emissions, transport, transformation, deposition, and air concentrations of acidic and associated pollutants; (2) effects of acidic deposition and associated pollutants in all principal areas of concern, including surface waters, forests, agricultural crops, exposed materials, human health, and atmospheric visibility; and (3) control measures and economic evaluations relevant to acidic deposition and associated pollutants.

Approximately 300 authors and 100 peer reviewers cooperated in producing and evaluating the documents. Authors were given specific guidelines to follow in preparing their Report to assure its quality, credibility, and completeness. For the summaries published in this document, authors were instructed by NAPAP to accurately describe the key findings of their Report and to reach definitive conclusions about the magnitude, direction, and consistency of experimental results and/or technical information. Each conclusion should be accompanied by a statement of certainty that is based on an overall evaluation of all information relevant to the conclusion. Authors were advised to avoid vague wording, heavily caveated statements, and presentation of numerous differing viewpoints solely to achieve universal agreement.

The Reports were subjected to several levels and phases of review — interagency review by the NAPAP Task Force agencies, peer review by independent experts, and open public review by all interested persons at an international meeting in February 1990, convened specifically to evaluate the Reports. Peer reviewers were asked to concentrate their efforts on examining the Report for its adequacy and accuracy in presenting and interpreting the broad range of information and issues associated with the subject matter being reviewed. Reviewers were charged with establishing that the conclusions were adequately supported by evidence, analysis, and argument, and that the summary section was consistent with the main body of the document in both tone and content.

These demanding guidelines and review processes were instituted by NAPAP to insure that the documents achieved the highest level of acceptability within the scientific community and were thus a credible source of information to contribute to the energy/environment decision-making process. The Reports provided the knowledge base to answer the policy-relevant questions posed in the NAPAP 1990 Integrated Assessment.[1]

The NAPAP Oversight Review Board provided overall scrutiny of the processes used in developing and reviewing the SOS/T Reports. In their report[2] to the Joint Chairs Council of the Interagency Task Force on Acidic Deposition, they state

> It is our judgement that the NAPAP scientific and technical findings as reported in various NAPAP documents and in the peer-reviewed literature are worthy to be used to inform public policy decisions. That is, they are generally of a quality and of a level of scientific impartiality and integrity as to merit credibility.

The National Acid Precipitation Assessment Program was re-authorized and re-directed by the 1990 Clean Air Act Amendments (U.S. Public Law 101-549). The technical reports summarized in this document represent the legacy of NAPAP's first phase and provide the foundation for the Program's future mission to evaluate the effectiveness of the nation's new legislation to control acidic deposition.

Patricia M. Irving
NAPAP Office of the Director
Washington, D.C.

September 1991

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1 National Acid Precipitation Assessment Program, *1990 Integrated Assessment Report*. 722 Jackson Place, NW, Washington, D.C. 20503.

2 Page 7 of *The Experience and Legacy of NAPAP*, Report to the Joint Chairs Council of the Interagency Task Force on Acidic Deposition. The Oversight Review Board of the National Acid Precipitation Assessment Program. April 1991.

ACKNOWLEDGMENTS

The reports summarized in this document are based on hundreds of scientific and technical investigations involving thousands of research managers, scientists, and graduate students. The remarkable quantity and diversity of information assimilated in these reports would not have been possible without the dedicated efforts of these bench scientists and managers, both within and outside of NAPAP.

The substantial effort and commitment required by the principal authors and their collaborators to compile, integrate, and synthesize the information associated with the acidic deposition phenomenon and summarized here is a notable accomplishment, one which should generate respect for those involved throughout their professional careers.

The peer reviews by agency professionals and independent experts contributed significantly to the quality, completeness, and credibility of the documents and were invaluable in assuring the integrity of the final product.

Finally, the initiation of this effort results from the vision and commitment of Dr. James R. Mahoney, former Director of NAPAP, who accepted the challenge of completing NAPAP's original mission.

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Acidic Deposition: State of Science and Technology, Volumes I - IV

Volume I	***Emissions, Atmospheric Processes and Deposition***
Report 1	*Emissions Involved in Acidic Deposition Processes*
Report 2	*Atmospheric Processes Research and Process Model Development*
Report 3	*Regional Acid Deposition Modeling*
Report 4	*The Regional Acidic Deposition Model and Engineering Model*
Report 5	*Evaluation of Regional Acidic Deposition Models*
Report 6	*Deposition Monitoring: Methods and Results*
Report 7	*Air Quality Measurements and Characterizations for Terrestrial Effects Research*
Report 8	*Relationships Between Atmospheric Emissions and Deposition/Air Quality*
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Report 10	*Watershed and Lake Processes Affecting Surface Water Acid-Base Chemistry*
Report 11	*Historical Changes in Surface Water Acid-Base Chemistry in Response to Acidic Deposition*
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Report 13	*Biological Effects of Changes in Surface Water Acid-Base Chemistry*
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ACRONYMS

ADMP	Acid Deposition Modeling Project
AERP	Aquatic Effects Research Program
AES	Atmospheric Environment Service
AFBC	Atmospheric Fluidized Bed Combuster
AIRS	[no definition given]
ALSC	Adirondack Lakes Survey Corporation
ANATEX	Across North America Tracer Experiment
ANC	Acid Neutralizing Capacity
APIOS	Acidic Precipitation in Ontario Study
ASRC	Atmospheric Sciences Research Center
ASTRAP	Advanced Statistical Trajectory
AUSM	Advanced Utility Simulation Model
CAA	Clean Air Act
CAPMON	Canadian Air and Precipitation Monitoring Network
CAPTEX	Cross-Appalachian Tracer Experiment
CCT	Clean Coal Technology
CORE	Core Establishment Research Network
CRESS	Commercial and Residential Emissions Simulation System
CRREL	Cold Regions Research Engineering Laboratory
CSEMS	Commercial Sector Energy Model by State
DDRP	Direct/Delayed Response Project
DFO	Department of Fisheries and Oceans
DOC	Dissolved Organic Carbon
DRI	Data Resources Incorporated
DSM	Demand Side Management
ECAM	Emissions and Cost Aggregation Model
ECIMS	Emissions and Control Cost Integrated Model Set
ELS	Eastern Lake Survey
EM	Engineering Model
EMEFS	Eulerian Model Evaluation Field Study
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
ESSA	Environmental and Social Systems Analysts Ltd.
ETD	Enhanced Trickle Down
FADMP	Florida Acid Deposition Monitoring Program
FDA	Food and Drug Administration
FDDA	Four Dimensional Data Assimilation
FGD	Flue Gas Desulfurization
FHA	Federal Housing Administration
GPCP	Global Precipitation Chemistry Project
GSM	Gas Supply Model
GTN	Global Trend Network
HOMES	Household Model of Energy by State
IAG	Internal Alkalinity Generation
ICE	Industrial Combustion Emissions
IFS	Integrated Forest Study
IGCC	Integrated Coal-Gasification Combined Cycle
ILWAS	Integrated Lake/Watershed Acidification Study
INRAD	Industrial Regionalization and Disaggregation
KST	Kendall Seasonal Fau Fest
LAF	Lake Acidification and Fisheries
LOAEL	Lowest Observed Adverse Effect Level

MAESTRO	Tree Crown Growth Model
MAGIC	Model of Acidification of Groundwater in Catchments
MAP3S	Multistate Atmospheric Power Production Pollution Study
MCCP	Mountain Cloud Chemistry Program
MET	Model Evaluation Team
MFL	Millions of Fibers per Liter
MISIT	Midwest Interstate Transformation and Transport Experiment
MM4	Mesoscale Meteorological Model
MOE	Ministry of the Environment Regional Air Pollution Model
MSA	Metropolitan Statistical Area
MSCET	Month and State Current Emissions Trends
NAAQS	National Ambient Air Quality Standards
NAAQS	National Ambient Air Quality Standards
NADP/NTN	National Atmospheric Deposition Program/National Trends Network
NADP	National Atmospheric Deposition Program
NAPAP	National Acid Precipitation Assessment Program
NCAR	National Center for Atmospheric Research
NCLAN	National Crop Loss Assessment Network
NDDN	National Dry Deposition Network
NEM	NAAQS Exposure Model
NGCC	Natural Gas-Fired Combined Cycle
NHIS	National Health Interview Survey
NMHC	Nonmethane Hydrocarbons
NRHP	National Register of Historic Places
NSS	National Stream Survey
NSWS	National Surface Water Survey
OSCAR	Oxidizing and Scavenging Characteristics of April Rains
PFBC	Pressurized Fluidized Bed Combuster
PROMPT	Process Model Projection Technique
PUC	Public Utility Commission
RADM	Regional Acid Deposition Model
RAIN	Reversing Acidification in Norway Project
RAP	RADM Analysis Program
RELMAP	Regional Lagrangian Model for Air Pollution
REPQ	Reseau d'Enchantillonnage des Precipitation du Quebec
RIVAD	Regional Impacts on Visibility and Acid Deposition
ROPIS	Response of Plants to Integrated Stress
RTM-II	Regional Transport Model
SCR	Selective Catalytic Reduction
SERTAD	Statistical Estimates of Regional Transport
SILVA	Mixed Conifer Forest Stand Simulation Model
SIMPMOD	Simple Model
SNSF	Sur Needboss Virkning PaSkog Og Fish (Acidic Precipitation - Effects on Forests and Fish)
SSR	Source-receptor Relationship
STIG	Steam Injected Turbines
SUNY	State University of New York
TEEMS	Transportation Energy and EMissions Modeling System
TMAM	Timber Market Assessment Model
TVA	Tennessee Valley Authority
UAPSP	United Acid Precipitation Study Program
UMACID	Lagrangian Puff Model by the University of Michigan
USDA	U.S. Department of Agriculture
UV	Ultraviolet
VOC	Volatile Organic Compounds
VOCM	Volatile Organic Compounds Model
WAM	Watershed Acidification Model
WLS	Western Lake Survey

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