

NATIONAL ATMOSPHERIC DEPOSITION PROGRAM
1981 TECHNICAL COMMITTEE MEETING
MINUTES

FIRST SESSION

Tuesday, November 3, 1981, 8:00 AM

The first session of the 1981 NADP Technical Committee Meeting convened in St. Louis with Ellis Cowling, Chairman, presiding. A list of attendees is attached. Ellis welcomed the participants and made a few general remarks regarding the recent publicity on acid deposition. He then talked about the Interregional proposal and the State Agricultural Experiment Station structure. Copies of the IR proposal were made available. He commented on what needs to be done to improve the program and thanked all of the people present for their interest and active participation in the program.

Keith Huston, administrative advisor for the NADP, was introduced. Keith commented that the IR proposal speaks to the administrative needs of the State Agricultural Experiment Stations and described the experiment station structure on a regional and federal level. He quoted from President Johnson, "Come, let us reason together and find some consensus that will allow us to make some decisions," and stated that traditions of scientific debate are what govern NADP.

Chris Bernabo, the Coordinator of the Interagency Task Force on Acid Precipitation, was introduced. The role of the Task Force is to define the present state of the effort and to recommend to Congress and the President what options are available and where they should be going. They are now in the final stages of preparing the document. With the beginning of FY '82, the program will begin. This is not intended to be just a Federal effort. The Task Force is jointly chaired by EPA, NOAA and USDA. At the working level, there is a series of task groups covering the range of subject matter research areas in acid rain. He urged people to contact Kathy Daniel in his office with ideas and suggestions.

Ellis then introduced Jack Pickering of USGS who talked about atmospheric deposition monitoring. There are ten bureaus or agencies involved. NPS, USGS, TVA, DOE, NOAA, DOA, Forest Service, and EPA are the active agencies who have funding commitments. The intention is to have three networks--global trends (WMO existing network), national trends network (similar to NADP), and a research network (operation of sites doing research on monitoring).

Ray Hermann, head of the Effects on Materials Working Group of the Interagency Task Force on Acid Precipitation, was introduced. Ray listed the five agencies involved and their areas of interest. They are:

1. Bureau of Mines - Corrosion Effects
2. EPA - Inventory
3. National Park Service - Cultural Resources
4. Bureau of Standards - Development of Standards
5. USGS - Weathering

Clare Harris (USDA-CSRS) was introduced and gave the background on how NADP has achieved its current status. He feels there is a better chance of NADP being a sustained research effort if several agencies are involved. Clare stated that the USDA is committed to supporting NADP to achieve their interests.

Ellis Cowling showed maps making use of the NADP data as an illustration of how the NADP efforts are being used. He asked for any corrections or suggestions to the IR proposal and asked for any additions or corrections to the "International Directory of Acid Precipitation Researchers".

Jim Gibson passed out copies of his written progress report and an updated site map, and commented regarding the growing interest within the private sector. He stated that there are four subcommittees which provide input into the program, mentioned them by name and asked anyone interested in participating on any

of the four subcommittees to feel free to do so. He also:

1. Mentioned budgetary constraints which were experienced and the activities which were curtailed or delayed as a result.
2. Stated that a revised field form should be ready about December 1 and that we are also in the process of putting together a final draft of the new field operations manual.
3. Have had a number of compliments on the quality of the data and its reliability.
4. Pointed out the states where there is a potential of new sites coming on line.
5. Mentioned the joint NADP/CANSAP effort and made a few comments regarding the problems which have been encountered,
6. Mentioned the nonstandard data sets and how they are currently being handled in the data reports.
7. Stated that the Davis, California site is now on 12 month operation.

Plans for the coming year include starting a program of site visitation. This is critical to the Quality Assurance Program, and we will develop a major effort for next year if the funds are available.

Rick Linthurst, Coordinator for the EPA Acid Precipitation Program, announced that Ray Wilhour had replaced Norm Glass at the EPA lab in Corvallis. He talked about his program and described what happens to the proposals which are submitted. He will have a report out within the next few weeks. They are preparing their Critical Assessment Document on Acid Deposition and are working on a "national lakes and streams survey." They feel the need to give the policy makers real numbers and a reliable data base. He stated that the Directory of Acid Precipitation Researchers will be published sometime in January. They will be preparing solicitations relative to aquatic research and soil systems and will be developing an updated program plan as a result of new money, but they do not want proposals yet. They will be putting out a second annual report and are planning a program review of their program, possibly in conjunction with other EPA programs.

Gary Stensland, director of the Central Analytical Laboratory, was then introduced. He mentioned the site operator training sessions which were held at CAL in September and October and commented on a list of things which came up and to which CAL responded. They were:

1. Getting data back more quickly to the sites,
2. Asked to contact the sites when field and lab pH's were different (large differences),
3. Mentioned the draft version of the new field form which is currently in use,
4. Talked about the NADP/CANSAP program and the problems with not getting buckets and supplies back and forth across the border.

Ellis Cowling asked the participants to introduce themselves. Following introductions, Ellis asked that each subcommittee chairman give a brief statement about their activities. A nominating committee was appointed to select candidates for the position of Chairman, Vice Chairman, and Secretary for the Technical Committee. The nominating committee consisted of Bill Feder, Dudley Raynal, Sashi Verma, Mike Kelly, Ray Herrmann as chairman, and Keith Huston.

John Robertson reported for the Network Site Criteria and Standards Committee. The committee has been involved in site certification which will eventually include site visitation. They are interested in the representativeness of sites, where new sites should be placed and recommending a direction for new sites. The biggest responsibility of the committee is with quality assurance--how representative a site is of an area and how it is located and operated.

Dick Graham reported for the Methods Development and Quality Assurance Committee. They have been primarily looking at CAL operations to be sure quality of data is sufficient to carry out mathematical and

statistical analyses. They are also looking at methods development and will look at metals program--what needs to be done by 1985, should NADP remain as is or expand.

Warren Knapp, Vice chairman of the Data Analysis Committee, reported that the committee has been concerned with archiving NADP data, questions about format and technical aspects of data output, and involved in comparison of map products. The committee should consider the strengths and weaknesses of the present archiving of data and should consider what changes would need to be made if EPA could not continue this service. The committee will consider the wording of the disclaimer statement in the data reports and make a recommendation. Peter Finklestein, who was representing Jerry Akland at the meeting, stated that the EPA data bank contains NADP, and Great Lakes data. The coding manual has been updated and will be sent out to all interested parties soon.

Jay Jacobson reported for the Effects Research Subcommittee. They supervised a cooperative study to compare results from six labs on effects of simulated acid precipitation. The subcommittee would like to extend its efforts in the next year to soils, aquatic and forest ecosystems.

SECOND SESSION

Tuesday, November 3, 1981

The Tuesday afternoon session was comprised of technical reports on the Analysis of Atmospheric Deposition Data organized by Don Bogen and Jay Jacobson. The following reports were given:

1. Doug Sisterson, Argonne National Laboratory - Chemical analysis of weekly vs. event precipitation samples.
2. Van Bowersox, Central Analytical Laboratory - A comparison between MAP3S event and NADP weekly sampling at Bondville.
3. Mike Kelly, Oak Ridge National Laboratory - Preliminary analysis of TVA vs. Aerochem Metrics wet deposition monitoring data.
4. Peter Finklestein, EPA — Spatial analysis of acid rain data.
5. Steve Lindberg, Oak Ridge National Laboratory — Analysis of methods for collection of rain for trace metal analysis and modification of recent isopleth maps.
6. Don Pack, Consultant - Precipitation chemistry probabilities.
7. Patricia Irving, Argonne National Laboratory — Use of NADP data for effects research at Argonne.
8. Jake Peters, USGS - Chemical composition of bulk atmospheric deposition in the north central and northeastern United States, December 1980—March 1981.
9. Jerre Wilson, U. S. Military Academy - A method for examining potential impact of local emiss'cns.
10. Sagar Krupa, University of Minnesota - LRTAP vs. local source apportionment and their influence on rain chemistry in Minnesota.
11. Jim Galloway, University of Virginia - Chemistry of precipitation in remote areas of the world.

THIRD SESSION

Wednesday, November 4, 1981

The third session of the NADP Technical Committee Meeting convened at 8:30 a.m. with special project reports.

John Robertson showed an overhead of what is contained in a site file and discussed these items. He discussed his draft for a site information data base in conjunction with EPA and indicated what would be included in the data base. The base will contain 135 data elements in total.

Warren Knapp reported for the subcommittee of the Data Management and Analysis Committee. Their responsibility was to prepare a section on summary and analysis of NADP data for the annual report. They prepared maps based on 52 CANSAP and 42 NADP sites. He showed an overhead and talked about problems in coordination of the CANSAP and NADP data due to differences in protocol. He also talked about the differences between computer generated maps vs. hand analyzed maps. Ellis Cowling then stressed early publication in the name of NADP of the data which is being generated to assure NADP getting credit.

John Robertson discussed the National Trends Network. There will be four tasks involved: 1) Site criteria, 2) selection of areas where sites should be located, 3) comparison of other networks with siting criteria, 4) site visitation. He described their efforts to measure regionality of data. They are using ecoregions maps of the U.S. by Bailey and overlaying with an index map of 1/250,000. They then evaluate sites for regionality within each area. Keith Huston commented that from an agricultural point of view the ecoregion maps are not that useful and suggested that caution be used.

LeRoy Schroder presented a report on the Quality Assurance Program. Next year they will follow the same protocol except that the unused portion of the sample will be transported to CAL, the bucket cleared there, then the clean bucket returned to the site. Both blind samples will go to the USGS. When the blind sample arrives at CAL, a notice of the blind sample is sent to USGS. It is tested twice at CAL, once refrigerated and once at room temperature. They feel there is a slight bias in the sulfate measurement but they don't know why yet.

Rick Linthurst, LeRoy Schroder and Walt Heck are conducting an experiment to fine micro-scale differences between samplers. Ten wet-dry collectors have been set-up 4 pairs of event and weekly samplers, one weekly and event pair. It should give a good indication of the efficiencies of the samplers and the differences between weekly and event sampling.

Malcolm Still reported on the joint NADP/CANSAP monitoring effort. Six sites have been established near the border between the U.S. and Canada. Sampling was started in May of 1981, but there were difficulties in getting things across the border. Each site is following their own protocol. Jim Gibson commented that the future of this effort depends on continued funding from NOAA.

Mark Peden reported on the metals proposal. The first draft of the proposal was distributed in April, with a second draft being sent out in June. A third draft of the proposal is now ready to go out describing the distinct phases of the recommended plan. They hope to submit the final proposal to the funding agency early in 1982. They then asked for suggestions as to where to submit it. Don Pack suggested contacting EPRI. They are presently suggesting a four site monitoring network. This could eventually mean another collector at each site. Jim Galloway then commented further on the proposal and its history. He asked participants to respond when they are asked for information. There is increased concern with regard to metals in drinking water.

Mike Kelly talked about the watershed study working group. They want to establish a national network of watershed study sites to look at effects. They have conducted a search for participating watershed sites; 38 sites within the U.S. responded and 12 in Canada. They are now moving forward in developing a data base describing the site and the information presently available.

They are making three recommendations to NADP:

1. Promote a national or regional study of aluminum flux in freshwater systems.
2. Encourage the adoption of the LTER parameters listed for physical and chemical determinations. The Long Term Ecological Research (LTER) program is funded by NSF and consists of 11 sites.
3. Promote the development of other research topics focusing on the watershed level, especially efforts that make use of existing data bases and/or have national or at least regional significance.

Bruce Hicks presented the report from the Dry Deposition Working Group. Bruce thanked the people who worked on the group, especially Dick Graham and A. J. Johannes. They have conducted an analysis of the CAL information and generated a report which is now in the third draft. The problem is that dry materials fall into fine particle, coarse particle, and gaseous modes. He showed a series of overheads indicating some of the results and problems and the probability of getting useful samples. The working group made the following recommendations:

1. That network-wide dry collection be terminated.
2. That a small number of sites be set up to continue dry collection.

FOURTH SESSION

Wednesday, November 4, 1981

The Wednesday afternoon session of the Technical Committee Meeting convened at 1:30 p.m. with technical reports on Biological and Chemical Effects organized by Don Bogen and Jay Jacobson. The following reports were presented:

1. Walter Chan, Ontario Ministry of the Environment - Monitoring networks of acidic precipitation in the Ontario studies.
2. Dave Lueck, EPA - An overview of the Great Lakes Atmospheric Deposition Network (GLAD).
3. William A. Feder, University of Massachusetts - pH and heavy metals content of rainfall events collected over 33 months in Waltham, Mass.
4. U. S. Jones, Clemson University - Aspects of effects and analyses of atmospheric deposition in South Carolina.
5. Steve Lindberg, Oak Ridge National Laboratory - Sampling strategies for analysis of wet dry deposition interaction with forest canopies.
6. Neil MacDonald, Michigan State University - Effect of acid precipitation upon jack pine regeneration in northern lower Michigan.
7. Jay Jacobson, Boyce Thompson Institute - Preliminary report of a six-laboratory cooperative study on the effects of simulated acid rain on vegetation.
8. Jim Galloway, University of Virginia - Precipitation, nitric acid and biology.
9. Alan VanArsdale, Massachusetts Department of Environmental Quality Engineering - Changes in water chemistry over the past 40 years in some Massachusetts drinking water reservoirs.

Ellis Cowling established an advisory committee on dry deposition and gave them three charges:

1. Determine specific objectives of measurement.
2. Recommend a course of action.
3. Complete work by May of 1982.

The following people were named to the committee: Bruce Hicks, Chairman; Keith Huston, Steve Lindberg, Gary Stensland, Sashi Verma, and David Bennett with Jim Galloway and Jim Gibson acting as advisors regarding network design and coordination.

Copies of a proposal titled "Acid Rain Research Foundation," prepared by Harriet Stubbs Johnson, were passed out. This would be a public foundation.

FIFTH SESSION

Thursday, November 5, 1981

The fifth session convened at 8:30 a.m. with the first item of business being the request by the Ontario Ministry of the Environment to become a member of the NADP. *It was moved and seconded that the Ministry of the Environment be accepted as a member of NADP with Walter Chan as their representative.* The motion was carried.

The chair was then turned over to Clare Harris for election of officers. Ray Herrmann gave the report of the nominating committee. The slate consisted of Chairman, Ellis Cowling; Vice Chairman, Bill McFee; Secretary, Steve Norton and Jerry Walker. *Ellis Cowling was unanimously elected as Chairman of the Technical Committee. Bill McFee was unanimously elected as Vice Chairman.* It was asked that a background description of the two nominees for the position of secretary be given. Steve Norton is Chairman of the Geology Department at the University of Maine and works primarily in acid rain sensitive areas with respect to geology. Jerry Walker is a plant pathologist from the University of Georgia. He has been active in NADP since the outset of the program. *Steve Norton was elected as Secretary of the Technical Committee.*

Reports from the subcommittees were given.

Subcommittee #4--Effects Research Committee

Dave Shriner, Vice Chairman, reported that the committee had decided to modify to a three person leadership structure consisting of Chairman, Chairman-elect, and Vice Chairman to provide carryover of administrative detail and a longer continuity. For 1981-82, Jay Jacobson will remain as chairman, John Skelly will resume the role as past chairman, and Dave Shriner will continue as vice chairman. There are presently two active working groups within the Effects Research Subcommittee. They are watershed research, headed by Mike Kelly, and quality control of crops research, headed by Jay Jacobson and Dave Shriner. Two new working groups were established: 1) The relationship of physical and chemical characteristics of atmospheric deposition to effects research consisting of Pat Irving, Owen Bricker, Dave Shriner, Bill McFee, and Jay Jacobson; and 2) Effects on materials with Steve Norton and Ray Herrmann.

For next year's technical committee meeting, speakers will be sought to give a critical review in the areas of: 1) effects on materials, 2) fish toxicity effects, 3) status of aluminum mobilization and toxicity.

The Technical Committee Chairman charged the subcommittee to develop ways to foster integration of deposition data and effects research and to undertake special activities in the support of research activities, the development of new approaches, and the synthesis of new information. Rick Linthurst described the current research supported by the EPA North Carolina State Acid Rain Program, the new funds, and direction for acid rain effects research.

Subcommittee #3--Data Management Analysis Committee

Officers for the coming year will be Warren Knapp, Chairman; and Steve Lindberg, Vice Chairman. Items of business conducted were:

1. Problems with archiving NADP data in the EPA data bank. Since the EPA archiving system cannot presently accommodate identification of each irregular sample type, *the subcommittee recommended that non-standard samples such as bulk, long duration, etc., not be archived in the EPA system until such time as proper identification can be provided.* Comments should be added to the headers of the EPA-generated data tapes to indicate that additional data for missing samples in any set may be available from the Coordinator's office. The question was raised as to what to use as the detection limit values for EPA-archived data. Actual detection limits differ for diluted vs. undiluted samples and the EPA system can accommodate only one limit value. The subcommittee suggested that the higher detection limit value associated with undiluted samples be reported for all samples and there was general agreement.
2. The subcommittee proposed an alternative version of the disclaimer statement used in data

reports which was accepted by the Technical Committee members. The revised statement is as follows: "The data included in this report were generated by the National Atmospheric Deposition Program Monitoring Network. As is our intent to ensure the highest quality data possible, the entries have been carefully checked and the data precision and accuracy monitored by an independently administered Quality Assurance Program. Quality Assurance Reports are available that will allow the user to assess data quality. However, due to possible errors arising from a number of causes normally associated with the collection, analysis and reporting of field data, the user is cautioned to exercise judgment in interpreting individual values."

The committee then discussed form and content of future NADP technical reports. Jim Gibson indicated that the publication of a formal annual report is probably beyond the limited resources currently available to the project. The subcommittee agreed with Jim's suggestion to reinstate publication of the NADP Newsletter as a means of distributing technical information and publicizing the collective and individual research activities of the scientists affiliated with NADP. Specific suggestions as to the type of material which might be distributed by the newsletter include: samples of annual or seasonal chemical concentration/deposition type of material which might be distributed by the newsletter include: samples of annual or seasonal chemical concentration/deposition maps produced from network data, interpretive notes and summaries of quality assurance data, lists of publications and data available through the Coordinator's office, information on how to obtain data tapes from the EPA archiving system, bibliographies of recent publications relating to NADP objectives and future articles highlighting the results of research projects recently completed by special committees or individual NADP scientists.

Subcommittee #2--Methods Development and Quality Assurance Committee

Leo Topol is the new Chairman, with Jerry Aubertin serving as Vice Chairman. The following items of business were discussed:

1. They made the following recommendations concerning the fact that CAL is approaching the saturation limit due to the number of sites being added to the program.
 - a. *That CAL continue as the Lab for the inorganic analysis.*
 - b. *That the Executive Committee write a letter to CAL indicating a continued commitment from NADP to CAL.*
 - c. *That CAL plan expansion to the number of sites to be specified by the Executive Committee.*
 - d. *That the number of sites in the NADP prior to the expansion of CAL not exceed CAL's capacity to provide quality analysis of samples.*
 - e. *That a subcommittee be formed to investigate the requirements for analysis by 1985. This group will be chaired by Leo Topol.*
2. Deterioration of the foam pad appears to be a problem in the samplers and *the committee recommended that foam lids be procured and distributed to all sites on a yearly basis.*
3. *That CAL examine the dry-wet side data to determine if a fewer number of buckets can be analyzed.* A reporting date of March 1 was established.
4. CAL has noticed a positive sodium and sulfate bias and feel the lids may be contributing to the problem. *Going forward, new lids are to be rinsed more thoroughly at CAL before distribution.* These will be deionized water rinses. Half of the buckets will be inverted for the 24-hour leaching period.

The committee also discussed:

5. The need for all sites to meet the minimum specifications for instruments contained in Appendix 1 of the Operators Manual and strongly recommended to committee #1 that before any certification is

granted, the site have the required equipment.

6. A recommendation that the Data Analysis Committee reevaluate reporting of field pH in data reports.
7. Quality control of pH conductivity measurements at sites is being conducted by USGS. A new round of samples was mailed to sites in the last couple of weeks.

The committee strongly suggested that subcommittee #2 be represented on any special committees looking at new methods.

Subcommittee #1--Network Site Criteria and Standard

John Robertson will remain as chairman of the committee with John Miller serving as Vice Chairman and Jerry Walker as Secretary. The committee considered the following items:

1. Appointed a committee consisting of Dave Bigelow and John Robertson to look at the existing site description questionnaire and information package material. The recommended changes will be finalized before spring and sent out for committee review.
2. They recommended continuation of the U.S./Canadian joint monitoring effort and encouraged Jim Gibson to make every effort to obtain continued funding. Suggested he also seek other sources of funding in the event NOAA could not continue providing support.
3. A review of site folders will start in preparation for site certification.
4. Considered the problem of non-standard instrumentation and the question of enforcing compliance. A subcommittee consisting of Wayne Martin, chairman; Dave Bigelow, Scott Dossett, Jerry Walker, and LeRoy Schroder was appointed to draft general specifications for recommended equipment.
5. The committee feels there is a problem with the way specifications are written and enforced. They are asking for a resolution from the Technical Committee regarding the following:
 - a. That all new sites not be allowed to start operation until they meet the specification for rain gages in the draft operators manual and that all current sites not meeting the specification in the draft operators manual upgrade to the specification within one year from the date of enactment. (Note: See Technical Committee minutes. These items were discussed and voted on in slightly modified form.)
 - b. That all new sites not be allowed to start operation unless they have an event recorder on the same time axis as the precipitation record and that one year from enactment all current sites must upgrade to this specification. (Note: See Technical Committee minutes. These items were discussed and voted on in slightly modified form.)
6. The committee requested that the Vice Chairmen of committees #2 and #3 be designated to work with committee #1 to review the certification. They want to establish criteria. This group will decide what changes to recommend for nonconformance. John Miller will initiate a meeting.

Ellis Cowling suggested that the Technical Committee vote on some of the recommendations made by subcommittee #1. It was moved and seconded that all sites be required to have the equipment listed in Appendix 1 of the field manual at start up. This list of equipment was read to the Technical Committee. It was then moved and seconded that the motion be amended to read only new sites be required to meet the Appendix 1 requirements and that current sites be required to acquire the equipment within 1 year. The amendment was carried. The motion to make Appendix 1 specifications a requirement, carried.

It was recommended that within one year sites be required to have event recorders on collectors on the same time axis as the rain gage, except that those presently operating with equipment providing equivalent information be allowed to continue. A motion was made and seconded to this effect. There was considerable discussion as to how many sites this might involve and the financial ramifications of this motion. The motion carried.

Ellis Cowling talked about the need for additional funds to carry on all of our activities. Projects requiring additional funding are: continuation of the joint US/Canadian effort, site visitations, operator training, increased analysis of data, midyear subcommittee meetings, back-up equipment, newsletters. EIS hopes that the passage of the IR proposal will allow for some of these items to be accomplished. Ellis announced that he has received suggestions for amendment and corrections to the IR proposal and thanked everyone for their comments to the International Directory. He then commented that NADP wouldn't run if it wasn't for the contributions of many people, asked all who feel they are on the outside of the organization to join in and put their shoulders to the collective wheel. Rick Linthurst then suggested the appreciation of the group be shown to Ellis Cowling for his contributions to the program and asked everyone to give Ellis a round of applause.

The 1981 Technical Committee Meeting officially adjourned at 12:30 p.m.

Technical Committee Meeting Participation List
1981, St Louis, MO

<u>Participant</u>	<u>Affiliation</u>
NehI Aldridge	International Paper Company
G.M. Aubertin	Southern Illinois University
Sue Bachman	Illinois State Water Survey
Van Baker	Colorado State University
Ron Becker	Wisconsin Department of Natural Resources
David Bennett	U.S. Environmental Protection Agency
Chris Bernabo	Interagency Task Force on Acid Precipitation
David Bigelow	Colorado State University
Don Bogen	U.S. Department of Energy
Wesley Bradford	U.S. Geological Survey
Owen Bricker	U.S. Geological Survey
Walter Chan	Ontario Ministry of the Environment
Boris Chevone	Virginia Tech
Stan Coloff	Bureau of Land Management
Ellis Cowling	North Carolina State University
Kathy Daniel	Colorado State University
Scott Dossett	Illinois State Water Survey
Kathy Douglas	Illinois State Water Survey
Eric Edgerton	Environmental Science & Engineering
W. A. Feder	University of Massachusetts
Peter Finkelstein	U.S. Environmental Protection Agency
James Galloway	University of Virginia
James Gibson	Colorado State University
A. R. Gilmore	University of Illinois
Richard Graham	U.S. Military Academy
Clare Harris	U.S. Department of Agriculture
James Hart	Michigan State University
Raymond Hermann	National Park Service
Bruce Hicks	NOAA
Rudolf Husar	Washington University
Keith Huston	North Cental Association of Agricultural Experiment Station Directors
Patricia Irving	Argonne National Laboratory
Jay Jacobson	Boyce Thompson Institute
John Jansen	Birmingham, Alabama
J. Preston Jones	Louisiana State Uniersity
U. S. Jones	Clemson University
J. M. Kelly	Tennessee Valley Authority
Vance Kennedy	U.S. Geological Survey
Warren Knapp	Cornell University
Sagar Krupa	University of Minnesota
Steven Lindberg	Oak Ridge National Lab
Rick Linthurst	North Carolina State University
David Lueck	U.S. Environmental Protection Agency
Neil MacDonald	Michigan State University
Bernard Malo	U.S. Geological Survey
C. Wayne Martin	USDA Forest Service
Dan Matias	New York State Electric & Gas
William McFee	Purdue University
Stephen Norton	University of Maine at Orono
D. H. Pack	McLean, VA
Kyaw tha Paw U	Purdue University
Mark Peden	Illinois State Water Survey
Jake Peters	U.S. Geological Survey
Jack Pickering	U.S. Geological Survey
John Pinkerton	NCASI

Dudley Raynal	SUNY - Syracuse
Dave Rengert	Niagara Mohawk Power Corporation
John Robertson	U.S. Military Academy
LeRoy Schroder	U.S. Geological Survey
Dick Semonin	Illinois State Water Survey
David Shriner	Oak Ridge National Laboratory
Douglas Sisterson	Argonne National Lab
Loretta Skowron	Illinois State Water Survey
Gary Speiran	U.S. Geological Survey
Kenneth Steele	University of Arkansas
Gary Stensland	Illinois State Water Survey
Malcolm Still	Atmospheric Environment Service
Laura Terkeurst	Michigan Department of Natural Resources
Leo Topol	Rockwell International EMSC
Alan VanArsdale	Massachusetts Department of Environmental Quality Evaluation
Shashi Verma	University of Nebraska
Jerry Walker	University of Georgia
George Weaver	Southern Illinois University
Jerre Wilson	U.S. Military Academy
Llew Wortman	University of Maine