

NATIONAL ATMOSPHERIC DEPOSITION PROGRAM

1980 TECHNICAL COMMITTEE MEETING

MINUTES

FIRST SESSION

Tuesday, October 21, 1980, 8:30 a.m.

The first session of the 1980 NADP Technical Committee Meeting convened in St. Louis with Ellis Cowling, Chairman, presiding. A list of attendees is attached. Ellis furnished a written report and discussed the items contained in the report. He also distributed a 1979-80 calendar indicating the major activities of Jim Gibson, Rick Linthurst, and himself on behalf of NADP. He touched briefly on happenings within the various agencies and on the President's Acid Rain Plan. Seven agencies were listed in the President's message, which stated that a federal acid rain plan should be developed. A task force has now been established which includes representatives from all the agencies.

Orie Loucks said a few words about the initiative of the Office of Technology and Assessment, and stated that their principal emphasis will be on acid rain and oxidants. They will be focusing on the objectives of the Congress, which include international, resource, and economic issues. Ellis then moved on to the report of the Executive Committee, with the first item being reports from the Subcommittee Chairmen.

Major John Robertson of Subcommittee Network Site Criteria and Standards, reported that the Committee's activities for the year centered in three major areas:

1. Bench mark network. A working group of the larger committee had been established to define a bench mark or core network, which would be a subset of the larger network. They have been asked to present a proposal for funding. This bench mark network would conduct more intensive monitoring than that being conducted by the major network.
2. Certification. To date, the NADP sites have been operating on a provisional basis. The committee is now going to begin evaluation of sites which have been operational for two years. There will be two steps to the evaluation. The first is to certify the site as an NADP site, and the second will be to classify the site in terms of its utility for other researchers.
3. Proposal. The last area, which correlates to certification, will be preparation of a proposal for funding of the certification process, including site visits.

Don Bogen reported that Subcommittee #2, Methods Development and Quality Assurance, had held a special meeting to review the problems of field pH and conductance. He said that certain modifications will be made to the field manual, and their committee's major emphasis has been on the Quality Assurance Program. Bernie Malo then discussed the current USGS activity in quality assurance. He described the blind sampling process and stated that the data will be included in the next NADP Quality Assurance Report. He asked the cooperation of all the site operators in the blind sampling procedure.

Jerry Akland reported for Subcommittee #3 Data Management and Analysis, and stated that there are presently two mechanisms for obtaining data from the EPA-managed data system at Research Triangle Park. You may call or write Jerry (919-541-2346), or there will be an interactive system available which has not yet been tested. The Committee met, discussed, and made recommendations for the content of the Annual Report and what data manipulation (i.e., isopleth plots) should and should not be included in the report. The Committee also discussed the data bank, what its output program should be, how the quality assurance data should be included in the data bank and how the data would be delivered to the users, and recommended a minimum statistical package be developed to be applied to all data.

John Skelly then reported for Subcommittee #4, Effects Research. Most of the Committee's activity for the year will be a result of the Technical Committee Meeting. He distributed the agenda for the Tuesday afternoon session which will consist of research station reports, and the Wednesday afternoon session which will be a panel discussion on "Relevance of Deposition Data to Understanding affects of Acid Rain." Jay Jacobsen stated that the program Wednesday is an initial effort to try to strengthen the link between deposition data and effects. Mike Skelly said that the workshop Thursday on "Watershed Studies" is an extension of affects research on a grander scale.

Gary Stensland reported on the activities of the Central Analytical Laboratory and announced a meeting Tuesday evening for people interested in site operation. This will be an open session with representatives of CAL and Aerochem Metrics in attendance. Gary then presented figures pertaining to the number of NADP sites sampling and the number of samples analyzed for the past year. Other CAL activities for the past year have been:

1. Training. CAL has designed a field operator's training course and presented the first program on October 16 and 17 with thirteen site operators attending. In addition, CAL has trained the NOAA/WMO site operators and the four site operators from the ESEERCO sites in New York.
2. Quality Assurance Report. The first report was completed in March and is in the mail to Jim Gibson for publication.
3. Efforts for the Next Year. The main priority will be to keep up with the growth of the network. They plan to monitor and evaluate site operations by increasing their efforts at working with the sites and being aware of what is happening week by week at the sites. They will increase their efforts to certify and validate the data sent to Colorado State University for the data reports.

Van Bowersox then spoke regarding rain collection data "representativeness." Van elaborated by saying that collection efficiency is the degree to which the measuring device represents the precipitation that fell. In general, CAL feels the sites are doing a good job of representing the rain that fell. CAL is looking for a better way to monitor the weekly site reports and to alert the site operators to any problems.

Ellis Cowling then discussed funding for NADP and stated that NADP is a voluntary association of interested scientists who have obtained local funding. Sampling costs are paid for by voluntary contribution. In addition, NADP receives funding from the North Central Region of the State Agricultural Experiment Stations, USDA SEA/CR, USGS, National Park Service, EPA, NOAA, BLM, the Forest Service, and several state agencies and private industries. This funding supports not only monitoring, but also coordination and quality assurance. In addition, NADP receives a large contribution of time, especially from USGS, EPA and DOE. The Executive Committee of NADP is exploring possibilities of attaining additional support by other mechanisms. There are several options:

1. The Committee of Nine (which advises the Secretary of Agriculture in the conduct, management and administration of cooperative regional research) has asked that presentations describing the NC-141 program be made to other regional experiment stations with the possibility of NADP becoming an interregional project.
2. Action of the Interagency Committee (President's Acid Rain Plan) which at the present time has not presented any budget figures. NADP is continuing its expansion of contacts with agencies as additional resources will be necessary if the Program is to continue to operate at the quality desired. The Executive Committee is hoping that the entire interagency task force will be receptive to making NADP the formal foundation far the national trend network.

Jim T Gibson then presented the Coordinator's report and mentioned again the calendar handout which was put together by Rick Linthurst, indicating the outside aspects in which Rick, Jim, and Ellis had been involved. Internally, Jim's office provides the link between the Executive Committee, the Technical Committee, CAL, and the sites. Specific activities of the coordinator's office have been:

1. Publication of the Data Reports - forwarding of taped material to EPA for inclusion in the data management system.
2. Publication of the Toxic Substances Report.
3. Responsible for developing proposals:
 - A. The National Park Service proposal, which is the basis for the twelve existing National Park Service sites. There will be four new National Park sites in 1981. located at Shenandoah, Grand Canyon, Theodore Roosevelt, and one other as yet unnamed. -
 - B. Support of EPA/NOAA/WMO sites which is a group of twelve sites.
 - C. Support from NOAA for the joint CANSAP/NADP network which will involve three sites each in the U.S. and Canada, operating two samplers at each site.

A question was asked about procedures employed in the refusal to include a proposed site in the network. Jim responded that this may be accomplished in two ways:

1. Informally by contact with the agencies or institutions who are interested in establishing a site and who, through their conversation with the Coordinator, are informed that the location for the site is not acceptable based on NADP criteria.
2. Formally by the submission of a site description questionnaire which is evaluated and refused by decision of the Executive Committee. The Executive Committee is now in the process of turning down two sites.

Jim discussed handouts of the isopleth maps which are the first attempt with the newly acquired software. The maps show the combined CANSAP and NADP information for weighted pH annual average for 1979, and Jim went on to state that these maps do not currently comply with all the suggestions of the Data Management and Analysis Subcommittee.

SECOND SESSION

Tuesday, October 21, 1980, 1:00 p.m.

The Tuesday afternoon session was comprised of presentations by site operators and participants as follows:

Ten-minute Presentations

1. Chuck Hakkarinen - Electric Power Research Institute
2. James A. Lynch - Pennsylvania State University
3. Raymond C. Mathews and Gary L. Larson - National Park Service, Great Smoky Mountains National Park
4. John K. Robertson - U.S. Military Academy, West Point, New York
5. Dudley J. Raynal - SUNY, College of Environmental Sciences and Forestry
6. Leo E. Topol - Rockwell International
7. D. N. Whelpdale and M. E. Still - Atmospheric Environment Service, Canada.

8. Gary Stensland - Illinois State Water Survey
9. A. J. Johannes - Renssalaer Polytechnic Institute

Five-minute Presentations

1. Stan Coloff - Bureau of Land Management
2. Warren W. Knapp - Atmospheric Sciences, Cornell University
3. H. Riekerk - University of Florida
- 4.. Kenneth Steele - University of Arkansas
5. Jerry T. Walker - University of Georgia, Georgia Agricultural Experiment Station
6. Dave Shriner - Oak Ridge National Laboratories
7. Sashi Verma - University of Nebraska
8. Boris Chevone - State University of Virginia.

EPA Acid Precipitation Program

Rick Linthurst, coordinator for the EPA Acid Precipitation Program at North Carolina State University, was asked to talk about this program. He announced that they are just getting started and distributed handout material regarding the program. The status report will be ready sometime in November, and anyone interested in receiving this report may write to Rick's office to request a copy. He hopes there will be a solicitation for proposals early in 1981.

New Officers

A nominating committee consisting of Ray Herrmann, Clare Harris, Jerry Walker, Warren Knapp, and Vance Kennedy was named to recommend a slate of officers for the 1980-81 year. New officers will be elected at the Wednesday morning session.

THIRD SESSION

Wednesday, October 22, 1980, 8:30 a.m.

The Wednesday morning session convened following meetings of the individual subcommittees. The first item of business was subcommittee reports.

Subcommittee #1 - Network Site Criteria and Standards

Election of officers was held with John Robertson, U.S. Military Academy, being elected Chairmand and John Miller, NOAA, elected as Vice Chairman.

John Robertson reviewed Committee activities since the last meeting:

1. Herb Volchok's resignation as Chairman.
2. Bench Mark Working Group's progress.
3. Review of site documentation.
4. Strawman draft proposal for site certification.

A working group consisting of John Teasley, Wayne Martin, Malcolm Still, and Stan Coloff will review the new site selection criteria package and suggest changes. Written comments will be sent to John Robertson for consolidation.

The Committee considered whether a site would be allowed to operate on a part-time basis. The Committee agreed that all sites should operate on a year-round basis with no deviation. Specifically:

1. The Davis, California site should agree to operate on a year-round basis or not operate as part of NADP.
2. The Isle Royale site was reviewed. The Committee had no hesitation on a site at Houghton operating on a year-round basis. A site on the island on a part-time basis was not acceptable. When a site can operate on the island year-round, then it should become part of NADP. The Houghton site was thought not to be the same climatologically as the island site. The Committee felt the Park Service would be best served by a year-round site on the Minnesota shore.

The Committee considered whether NADP sites located on small regional airports met the siting criteria. The Committee agreed that the simple fact that the site was at an airport did not rule out its utility as an NADP site. The Chairman was instructed to work with NOAA in locating NADP samplers at the best practical location on these airports. Also, records of the number of flights per year should be maintained to monitor the growth of these airports.

The Committee agreed to meet at midyear to consider the classification scheme in the Site Selection Manual with an eye toward removing the possible misinterpretation of the current A, B, C, D system. A dual designation indicating regional setting and level of instrumentation will be considered.

The Committee directed the Chairman to work with Jim Gibson to immediately seek funds on the order of \$50,000 - 80,000 to allow site visitation before the next Technical Committee meeting. The development of a site certification proposal should continue.

Subcommittee #2 - Methods Development and Quality Assurance

Election of officers was held with Dick Graham, U.S. Military Academy, being elected as Chairman and Leo Topol, Rockwell International, elected as Vice Chairman.

The Committee considered the following:

1. Discussion and review of field versus lab pH and conductance measurements.
2. Recommendation to Technical Committee that equipment specified in the Site Operator Manual for pH and conductance measurements be used or acquired as soon as possible to perform these measurements.
3. The USGS will dispense pH and conductivity standards to site operators on a quarterly basis for evaluation of the site operator. This program will be initiated as soon as possible.
4. CAL will continue to dispense conductivity check standards which are to be used only by the site operator for evaluation of instrumentation.
5. CAL will now review the weekly field forms upon receipt of samples for differences in field measurements versus lab measurements. If the variation in pH is greater than 0.5 units or 8 units in specific conductance, then CAL will call the site operator to alert them to the discrepancy. The site operator should then check the instrumentation via the Site Operator Manual to establish any problems.
6. The Field Observer Reporting Form was approved for use after correction of a few typographic errors.

7. There was extensive discussion and review of the Quality Assurance Program. Bernie Malo of the USGS presented a status report on the external QA program. It was stated that the program is operating satisfactorily, and the data obtained from CAL was quite good. There has been a modification in the protocol of the program. The change relates to observed differences in values reported by CAL and expected by the USGS. In the new set-up, if differences are observed and CAL validates their original results, then the sample is returned to the USGS for remeasurement. If the USGS validates the CAL results, then these data will be added to the external quality assurance data base. Therefore, the USGS program is to evaluate only the analytical measurement phase of the QA data.
8. Leo Topol will circulate to the Subcommittee, for review and comment, a document for checking the calibration of the rain gage at the sites.
9. The CAL will review the field forms for agreement of the rain gage to the volume collected by the wet/dry collector. If disagreement of more than 20% is observed between the collectors, CAL will contact the site operator to try to rectify the problem.
10. The Subcommittee recommended to the Technical Committee that the pad inserts for the head of the wet/dry collector not be removed during winter operations.
11. A letter from Wayne Martin concerning sampler modification for winter operation will be sent to all site operators.
12. There was discussion of the Site Operator Training Program. There has been positive feed-back as to the merits of the training program. The program will continue subject to additional funding from EPA.
13. There were 15 attendees of the Subcommittee deliberations.

Subcommittee #3 - Data Management and Analysis

Election of officers was held with Gerald Akland, US EPA, RTP, being promoted from Vice Chairman to Chairman and Warren Knapp, Cornell University being elected as Vice Chairman. The following business was conducted:

1. Quarterly Data Reports were reviewed.
 - A. Several improvements were noted in the last report.
 - B. It was noted that the use of Greenwich Mean Time (GMT) in the data reports sometimes resulted in erroneous dates. After some discussion of possible adjustments in the data formatting program, it was suggested that GMT be dropped and everything reported in local standard time. The Subcommittee did not act on this, but asked for comments from the entire Technical Committee.
 - C.. Noted a need to clarify the national map symbols to make it clear that all those shown on the map are not reporting in the current report.
 - D. Noted need to add a mileage scale to each of the state maps.
 - E. The locations shown on state maps and the national map need to be reconciled with each other and checked for accuracy.
 - F. The omission of field determinations of pH and conductivity from the quarterly report due to problems in obtaining reliable values should be reviewed at the next Subcommittee meeting if new information on these determinations is available.

- G. Discussed charging for quarterly reports and decided that the present no-charge policy promotes distribution and use of the reports. Charges should be instituted if economics dictate.
2. The annual report needs were discussed and a Subcommittee consisting of Warren Knapp (Chairman), Pat Brezonik, Gary Stensland and Gerry Akland will prepare an initial draft of the annual report section, "Summary and Analysis of Monitoring Data ."
3. Data bank capabilities for varied outputs and data manipulations were discussed. The first need is for a routine that will provide volume-weighted monthly, weekly, or annual means of concentrations or total deposition. When doing monthly means, it is recommended that weekly values from the end of the month be partitioned into months proportional to daily rainfall values from the recording rain gage data.

Subcommittee #4 - Effects Research

Election of officers was held with Jay Jacobson, Boyce Thompson Institute, being elected as Chairman and Dave Shriner, ORNL being elected Vice Chairman. The following business was conducted:

1. Reports of Progress - Recommended Format for NADP Participants:
 - A. Progress.
 - B. NADP objectives, how are results related?
 - C. Plans for new research.
 - D. Publication - CRIS report format.
 - E. Sources of funding.
2. Report Bulletins (Dr. Reikerk) - Will prepare a sample draft for review by Technical Committee at a later time.
3. Next Year's Meeting Format - As per this year's format with continuation of 10 minute review sessions and special topics.
4. Effects Committee - Concern for consideration in Core, Long Term Trend, Bench Mark sites. We need to support major long term biological research sites as part of the overall planning for these sites.

Election of Officers

Dr. Keith Huston chaired the meeting during the election of officers. Dr. Huston spoke briefly about the cooperative spirit between the agencies and the organizations involved in NADP, and indicated that he was gratified to see NADP address not only global issues, but also the long-term issues.

Warren Knapp presented the report of the nominating committee which recommended a slate consisting of Ellis Cowling, Chairman; Don Bogen, Vice Chairman; and Bill McFee, Secretary, as officers for the 1980-81 year. The floor was then opened for nominations. A motion was made and seconded that the entire slate, as recommended, be considered.

There were no additional nominations.. The motion was carried. It was then moved, seconded, and carried, that the nominated slate of officers be unanimously elected.

Announcements

Jim Gibson announced that there would be an evening meeting of Subcommittees 1 and 2 to discuss siting of the CANSAP comparison study sites, and to formulate recommendations to EPA on location for their Inhalable Particulate Network (IPN) sites within NADP. Jim further announced that there is some money available in the coordination budget for interim Subcommittee meetings. Those persons interested in obtaining funding should see Jim regarding their request. He asked that the Subcommittees try to schedule their meetings to minimize costs.

Chuck Hakkarinen of EPRI announced that statistical data printouts for sites were available showing a total of eight different plots. Those printouts not picked up during the meeting would be mailed to the individual sites by Jim Gibson's office.

FOURTH SESSION

Wednesday, October 22, 1980, 1:30 p.m.

The afternoon session convened for a panel discussion titled "Relevance of Deposition Data to Understanding Effects of Acid Rain". Panelists for the session were:

Charles Driscoll, Syracuse University
Dean Jeffries, Ministry of the Environment, Canada
A.J. Johannes, Rensselaer Polytechnic Institute
William McFee, Purdue University
Jim McLenahan, Ohio Agricultural Research and Development Center
Jay Jacobson, Boyce Thompson Institute, presiding

Some of the questions to be considered by the panel were:

1. What measures are most valuable for determining changes in deposition over space and time?
2. Which measures are most useful for understanding effects on materials and structures, soil and their biotic populations, potable waters, fresh waters and their biotic components, forests, agricultural crops?
3. Is the data more relevant to same areas of effects research than others?
4. Are there any improvements that can be made to maximize the usefulness of information derived from the network?

Immediately following the conclusion of the panel discussion session, an informal meeting was held with the Aerochem Metrics representatives regarding problems with the sampler. Dr. Prospero circulated handout materials regarding the sampler and their proposed design features for a very large area automatic sensing wet-dry precipitation collector.

FIFTH SESSION

Thursday, October 23, 1980, 8:30 a.m.

Meetings of the working groups, organized by Jim Galloway, were scheduled. The work groups and covenors were:

1. Sampling and Analysis of Trace Metals on a Network-Wide Basis - Jim Galloway.
2. Analysis of Particulate Weekly Precipitation Samples - Bill Mcfee.

3. Integration and Analysis of Data from all North American Networks - Dick Semonin and Jake Hales.
4. Improvements in the measurement and Interpretation of Dry Deposition Measurements on a Network Basis - Ellis Cowling and Bruce Hicks

Working Group Reports

At 11. a.m. the large group reconvened for the purpose of hearing reports from the working groups.

Jim Galloway reported for the working group on measurements of metals in the NADP. The working group established the following objectives:

1. To determine if atmospheric deposition should be collected and analyzed for trace metals in the NADP.
2. If the answer is yes, where should the stations be? What should the metals be? How should we do it? What will it cost? What technique would we use to do the analysis? Who would do the analysis?
3. If the answer is yes, what would be the objectives of the NADP in such a program?

The NADP decided that we should be concerned with trace metals in atmospheric deposition because there are significant effects of anthropogenic activities on the concentrations of metals in atmospheric deposition. The objectives of the NADP Metal Program would be:

1. To develop procedures for the collection and analysis of selected trace metals on a network-wide basis.
2. Determine temporal spatial trends relative to anthropogenic influence.
3. Integrate the NADPM with effects research.

The Working Group realized that there were two possible next steps.

1. Assume that we knew enough about how to collect trace metals on a network-wide basis and how to treat the samples and then analyze them to immediately begin a network for trace metals in conjunction with the NADP.
2. Realize that we don't know enough and that we have to do some research on procedures first before we set up the network.

The Working Group decided to take the latter course. Therefore, the next step of the Working Group on Trace Metals is to develop a proposal to obtain funds to determine how to collect metals in atmospheric deposition before we begin a metals network.

The Working Group formed a committee to develop the proposal. The membership is:

Jim Galloway, University of Virginia, Chairman
Owen Bricker, USGS
Steve Norton, University of Maine
Gary Stensland, Central Analytical Laboratory
Don Bogen, Department of Energy
Bill Feder, University of Massachusetts
Russ Morris, U. S. Military Academy

Writing work on the various sections of the proposal will be begun by the middle of November and the

proposal will be ready for submission by the first of March, 1981. If the proposal is accepted, the work would begin around September 1981. There would be six months of research on techniques of how to collect, how to handle and how to analyze the trace metals and then a twelve-month period, beginning in the spring of 1982, with the operation of a four-or-five-station network using these new techniques. This four-or-five-station network would run for one year through the spring of 1983. Assuming we were successful in the operation of that small network, we would plan to expand the network in the summer of 1983 to include more stations..

Bill McFee reported that the Work Group on Analysis of Particulates proposed that NADP invite requests for release of filters for exploratory research into techniques which may yield useful data from the archived filters of wet and dry bucket particulates. The Executive Committee would be empowered to release up to 25% of filters from any one site and no more than 10% of total archived filters from samples taken prior to 1 January 1980. We would release the samples with the understanding that NADP would be credited in any release of the information, and that NADP would receive a written report of the results. This is a short-term offering. Requests must be received prior to 1 February 1981. This policy will be subject to review, and future offerings of the materials will be made after the initial results are reviewed.

Recommended that an ad hoc committee be appointed by the chairman to review these requests.

Jim Gibson presented the report from the Work Group on Data Analysis in the absence of the convenor, Jake Hales. The group established commonality of data analysis, commonality of network operations, and reporting of data as the factors to be considered. The group made the following recommendations:

1. A common statistical software package be written to produce tabulated "bare bones" statistical summary information. This should be executed for each year's data by each network, and should include:
 - A. means and extremes
 - B. log and normal distribution parameters
 - C. coefficients of determination
 - D. linear regressions with time
 - E. monthly deposition - weighted concentrations.

AND THAT'S ALL! More elaborate manipulations should be done by the USER! Units should be consistent with SARAD. This should be a FORTRAN program residual at all labs and at SARAD.
Action: Jaka Hales of MAP3S

2. Annual isopleths of concentration for North America should be produced with the consolidated data set. Action: NADP/EPRI
3. The above results should be published in a common medium on an annual basis. Action: NOAA

Problems were listed as:

1. What is commonly acceptable algorithm for data editing?
2. How do we handle rain gage vs sampler precipitation measurements?
3. How do we merge data for networks having different start/stop time?
4. What about parameters measured at one network and not by others?

Ellis Cowling presented the report for the Dry Deposition Work Group. The group made the following recommendations:

1. A working group on dry deposition within NADP should be created to explore means by which to improve our understanding of dry deposition processes and to recommend methods for the routine

collection of dry deposition. This group should consist of the following persons:

Bruce Hicks, Chairman

Herb Feely

John Teasley

Vance Kennedy

Dick Graham

A. J. Johannes

Pat Brezonik

John Miller

"Somebody from CAL" - Mark Peden

Someone from MACP leadership

Ellis Cowling

Jim Gibson

Jim Galloway

2. An effort should be made to analyze and interpret the dry deposition data collected to date. This will be done by Herb Feely, Dick Graham, Bruce Hicks and A. J. Johannes.
3. After analysis of available data by the above four persons, the working group should meet to consider the findings of this small group, and to formulate recommendations to the Subcommittee on Methods Development and Quality Assurance and to the Executive Committee.
4. Collection and analysis of "dry fall" should be continued as usual until a decision is reached about the value of the data being collected and the value of continuing, altering, or discontinuing the present methods of collection and analysis of "dry fall."

Announcements

Ellis Cowling suggested that all Subcommittee reports be mentioned in the next issue of the NADP Newsletter. He then named Jim Galloway to a special ad hoc position on the NADP Executive Committee titled "New Initiatives Leader." Jim Galloway will meet with the Executive Committee to bring forward any new initiatives suggested for the program.

SIXTH SESSION

Thursday, October 23, 1980, 1:00 p.m.

The Thursday afternoon session was devoted to a discussion of "A Network of Experimental Watershed Study Sites" organized by Mike Kelly.

The 1980 Technical Committee Meeting officially adjourned at 3 p.m.

Technical Committee Meeting Participant List
1980, St. Louis, MO

<u>Participant</u>	<u>Affiliation</u>
Gerry Akland	U.S. Environmental Protection Agency
Jerry Aubertin	Southern Illinois University
Chris Bernabo	NOAA
Don Bogen	U.S. Department of Energy
Van Bowersox	Illinois State Water Survey
Pat Brezonik	University of Florida
Owen Bricker	U.S. Geological Survey
Susan Burke	Aerochem Metrics
Walter Chan	Ontario Ministry of the Environment
Boris Chevone	Virginia Tech
Stan Coloff	Bureau of Land Management
Ellis Cowling	North Carolina State University
W.A. Feder	University of Massachusetts
Herbert Feely	U.S. Department of Energy
James Galloway	University of Virginia
James Gibson	Colorado State University
Richard Graham	U. S. Military Academy
Chuck Hakkarinen	Electric Power Research Institute
Clare Harris	USAD, SEA-CR
Walter Heck	North Carolina State University
J. David Helvey	USDA Forest Service
Gray Henderson	University of Missouri
Raymond Hermann	National Park Service
Keith Huston	North Cental Association of Agricultural Experiment Station Directors
Jay Jacobson	Boyce Thompson Institute
Dean Jeffries	Ontario Ministry of Environment
A. J. Johannes	Renssalaer Polytechnic Institute
J. Preston Jones	Louisiana State University
J. M. Kelly	Tennessee Valley Authority
Vance Kennedy	U.S. Geological Survey
Warren Knapp	Cornell University
Bruce Komadina	Illinois State Water Survey
Jeffrey Lee	U.S. Environmental Protection Agency
Rick Linthurst	North Carolina State University
Orie Loucks	Science Director, TIE
Thomas Lukow	Bureau of Land Management
James Lynch	Penn State University
Bernard Malo	U.S. Geological Survey
C. Wayne Martin	USDA Forest Service
Raymond Mathews	Great Smoky Moutains National Park
Dan Matias	New York State Electric & Gas
Jim McClenahen	Ohio Agricultural Research & Development Center
William McFee	Purdue University
John Miller	NOAA
Paul Miller	U.S. Forest Service
Russell Morris	U.S. Military Academy
Stephen Norton	University of Maine at Orono
Mark Peden	Illinois State Water Survey
Jack Pickering	U.S. Geological Survey
Monte Poindexter	NOAA
Joseph Prospero	University of Miami, RSMAS
Dudley Raynal	SUNY - Syracuse

John Robertson	U.S. Military Academy
Dick Semonin	Illinois State Water Survey
David Shriner	Oak Ridge National Laboratory
John Skelly	Virginia Polytech Institute
Loretta Skowron	Illinois State Water Survey
Mike Slater	Illinois State Water Survey
Randy Stahlhut	Illinois State Water Survey
Kenneth Steele	University of Arkansas
Gary Stensland	Illinois State Water Survey
Malcolm Still	Atmospheric Environment Service
John Teasley	Environmental Research Lab-Duluth
Dennis Tirpak	EPA Office of Research & Development
Leo Topol	Rockwell International EMSC
Alan VanArsdale	Massachusetts Department of Environmental Quality Evaluation
Shashi Verma	University of Nebraska
Jerry Walker	University of Georgia
Douglas Whelpdale	Atmospheric Environment Service