



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C. 20460

OFFICE OF THE ADMINISTRATOR
SCIENCE ADVISORY BOARD

January 16, 2007

MEMORANDUM

SUBJECT: Formation of U.S. EPA Science Advisory Board (SAB) Integrated Nitrogen Committee

FROM: Kathleen White, Designated Federal Official */Signed/*
EPA Science Advisory Board Staff Office (1400F)

THRU: Anthony F. Maciorowski, Ph.D. */Signed/*
Deputy Director
EPA Science Advisory Board Staff Office (1400F)

TO: Vanessa Vu, Ph.D.
Director
EPA Science Advisory Board Staff Office (1400F)

This memorandum summarizes steps taken regarding formation of a Science Advisory Board *ad hoc* committee to conduct an evaluative study entitled *Reactive Nitrogen: An Integrated Approach* and documents the determination process for appointing members to the Integrated Nitrogen Committee.

Formation of the Integrated Nitrogen Committee

The SAB Environmental Engineering Committee identified integrated nitrogen research and control strategies as an important environmental issue. Subsequent discussions with the Agency and the chartered Board indicated that this topic warranted the SAB's attention. The SAB Staff Office announced its intention to form an Integrated Nitrogen Committee, and sought public nominations for this committee in a *Federal Register notice* dated March 14, 2005 (70 FR 48: 2476-12477). The notice (Attachment 1) requested public nominations of technical experts with expertise in nitrogen biogeochemistry, effects, risk reduction, and control technologies. The committee will evaluate EPA environmental research and programs on reactive nitrogen, recommend improvements for research, and identify opportunities for integrated approaches to nitrogen management.

Fifty-one experts were identified for the Integrated Nitrogen Panel. The names and biosketches were posted on the SAB website with a request for public comment on August 21, 2006. (Attachment 2 is the Invitation to Comment.) The SAB Staff Office received 17 sets of public comments. (Attachment 3 lists those who provided comments.)

Conflict of Interest Considerations

18 U.S.C. 208 provision states that:

"An employee is prohibited from participating personally and substantially in an official capacity in any particular matter in which he, to his knowledge, or any person whose interests are imputed to him under this statute has a financial interest, if the particular matter will have a direct and predictable effect on that interest [emphasis added]."

For a conflict of interest to be present, all elements in the above provision must be present. If an element is missing, the issue does not involve a formal conflict of interest. However, the general provisions in the "appearance of a lack of impartiality guidelines" may still apply and need to be considered.

Personal and Substantial Participation:

Participating "personally," means direct participation. Participating "substantially" refers to involvement that is of significance to the matter [5C.F.R. 2640.103(a)(2)]. For this review, committee members will be participating personally in the matter through attendance at meetings, teleconferences and other means.

Direct and Predictable Effect:

A direct effect on a participant's financial interest exists if, "... a close causal link exists between any decision or action to be taken in the matter and any expected effect of the matter on the financial interest...A particular matter does not have a direct effect...if the chain of causation is attenuated or is contingent upon the occurrence of events that are speculative or that are independent of, and unrelated to, the matter. A particular matter that has an effect on a financial interest only as a consequence of its effects on the general economy is not considered to have a direct effect." [5 C.F.R. 2640.103(a)(i)]. A predictable effect exists if, "...there is an actual, as opposed to a speculative, possibility that the matter will affect the financial interest." [5 C.F.R. 2640.103(a) (ii)].

Particular Matter:

A "particular matter" refers to matters that "...will involve deliberation, decision, or action that is focused upon the interests of specific people, or a discrete and identifiable class of people." It does not refer to "...consideration or adoption of broad policy options directed to the interests of a large and diverse group of people." [5 C.F.R. 2640.103 (a)(1)].

The subject matter to be covered by this committee affects the interests of a large and diverse group of people. Therefore, the work of the committee is not considered to be a

particular matter as defined under 5 C.F.R. 2640.103(a)(1). As a result, the possibility of a conflict of interest is attenuated.

Appearance of a Lack of Impartiality Considerations:

The Code of Federal Regulations [5 C.F.R. 2635.502(a)] states that:

"Where an employee knows that a particular matter involving specific parties is likely to have a direct and predictable effect on the financial interest of a member of his household, or knows that a person with whom he has a covered relationship is or represents a party to such matter, and where the person determines that the circumstances would cause a reasonable person with knowledge of the relevant facts to question his impartiality in the matter, the employee should not participate in the matter unless he has informed the agency designee of the appearance problem and received authorization from the agency designee."

Further, 5 C.F.R. 2635.502(a)(2) states that:

"An employee who is concerned that circumstances other than those specifically described in this section would raise a question regarding his impartiality should use the process described in this section to determine whether he should or should not participate in a particular matter."

Each potential advisory committee member will be evaluated against the 5 C.F.R. 2635.502(a) general requirements for considering an appearance of a lack of impartiality. Information used in this evaluation has come from information provided by potential advisory committee members (including, but not limited to, EPA 3110-48 confidential financial disclosure forms) and public comment.

To further evaluate any potential appearance of a lack of impartiality, the following five questions were posed to all prospective advisory committee members

- 1) Do you know of any reason that you might be unable to provide impartial advice on the matter to come before the Committee or any reason that your impartiality in the matter might be questioned?
- 2) Have you had any previous involvement with U.S. EPA or other federal agency research or operational programs concerning reactive nitrogen, including collaboration, authorship or co-authorship of federal documents, or peer review functions?
- 3) Have you served on previous advisory panels or committees that have addressed the topic under consideration?
- 4) Have you made any public statements (written or oral) on the issue?
- 5) Have you made any public statements that would indicate to an observer that you have taken a position on the issue under consideration?

Prospective committee members were asked to provide information that would allow the SAB Staff Office to evaluate the possibility of a conflict of interest or a potential appearance of a lack of impartiality. Information used in this evaluation includes the confidential financial disclosure form (3110-48), the responses to the five questions above, and public comments.

The SAB Staff Office Director made the final decision about who serves on the Panel based on all relevant information. For the EPA SAB Staff Office, a balanced committee or panel is characterized by inclusion of candidates who possess the necessary domains of knowledge, the relevant scientific perspectives (which, among other factors, can be influenced by work history and affiliation), and the collective breadth of experience to adequately address the general charge. Specific criteria to be used in evaluation an individual committee member include: (a) scientific and/or technical expertise, knowledge, and experience; (b) availability and willingness to serve; (c) absence of financial conflicts of interest; (d) absence of an appearance of a lack of impartiality; and, for the Committee as a whole, (f) diversity of, and balance among, scientific expertise, endpoints, and adequate representation from existing SAB Committees and Panels addressing related issues.

The following experts were selected to serve on the Integrated Nitrogen Committee:

CHAIR

Dr. James Galloway, Professor of Environmental Sciences, Environmental Sciences Department, University of Virginia, Charlottesville, VA

MEMBERS

Dr. Viney Aneja, Professor, School of Physical and Mathematical Sciences, North Carolina State University, Raleigh, NC, USA

Dr. Elizabeth Boyer, Assistant Professor of Watershed Processes, Dept. of Environmental Science, Policy and Management, University of California, Berkeley, CA

Dr. Kenneth G. Cassman, Professor, Department of Agronomy and Horticulture, Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln, NE

Dr. Russel R. Dickerson, Professor & Chair, Department of Meteorology, The University of Maryland, College Park, College Park, MD

Dr. Otto C. Doering III, Professor, Department of Agricultural Economics, Purdue University, W. Lafayette, IN

Mr. William Herz, Director of Scientific Programs, The Fertilizer Institute, Washington, DC

Dr. Don Hey, Senior Vice President and co-founder of The Wetlands Initiative and Director of Wetlands Research, Inc., The Wetlands Initiative, Chicago, IL

Dr. Richard Kohn, Associate Professor, Animal and Avian Sciences, University of Maryland, College Park, MD

Dr. JoAnn S. Lighty, Director, Institute for Combustion & Energy Studies and Professor, Chemical Engineering, College of Engineering, University of Utah, Salt Lake City, UT

Dr. William Mitsch, Professor, Olentangy River Wetland Research Park, The Ohio State University, Columbus, OH

Dr. William Moomaw, Professor of International Environmental Policy and Director of the Center for International Environment and Resource Policy, The Fletcher School of Law and Diplomacy, Tufts University, Medford, MA

Dr. Arvin Mosier, Consultant and Visiting Professor, Agricultural and Biological Engineering Department, University of Florida, Mount Pleasant, SC

Dr. Hans Paerl, Professor of Marine and Environmental Sciences, Institute of Marine Sciences, Univ. of North Carolina, Chapel Hill, Morhead City, NC, USA

Dr. Bryan Shaw, Associate Professor, Department of Biological and Agricultural Engineering, Texas A&M University, College Station, TX

Mr. Paul Stacey, Supervising Environmental Analyst, Bureau of Water Management, Planning and Standards Division, Connecticut Department of Environmental Protection, Hartford, CT

Dr. Thomas L. Theis, Professor and Director, Institute for Environmental Science and Policy, University of Illinois at Chicago, Chicago, IL

CLEAN AIR SCIENTIFIC ADVISORY COMMITTEE LIAISON MEMBER

Dr. Ellis B. Cowling, University Distinguished Professor At-Large, Colleges of Natural Resources and Agriculture and Life Sciences, North Carolina State University, Raleigh, NC

Concurred,

/Signed/
Vanessa Vu, Ph.D.
Director
EPA Science Advisory Board Staff Office (1400F)

January 16, 2007
Date

Attachment 1

Federal Register: March 14, 2005 (Volume 70, Number 48), Page 12476-12477)
From the Federal Register Online via GPO Access

ENVIRONMENTAL PROTECTION AGENCY [FRL-7884-1] Science Advisory Board Staff Office; Request for Nominations, Ad Hoc Integrated Nitrogen Research Committee of the Science Advisory Board AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The U.S. Environmental Protection Agency (EPA or Agency) Science Advisory Board (SAB) Staff Office (hereinafter, the "Staff Office") is announcing the formation of a new Ad Hoc Integrated Nitrogen Research Committee of the Science Advisory Board (hereinafter, the "Committee") and is hereby soliciting nominations for this Committee.

DATES: Nominations should be submitted by April 11, 2005, per the instructions below.

FOR FURTHER INFORMATION CONTACT: Any member of the public wishing further information regarding this Request for Nominations may contact Ms. Kathleen White, Designated Federal Officer (DFO), EPA Science Advisory Board Staff, at telephone/voice mail: (202) 343-9878; or via e-mail at: white.kathleen@epa.gov. General information concerning the SAB can be found on the EPA Web site at: <http://www.epa.gov/sab>.

SUPPLEMENTARY INFORMATION: Background Reactive nitrogen compounds (Nr)--that is, all biologically active, photochemically reactive, and radiatively active nitrogen compounds in the atmosphere and biosphere of the Earth can cause multiple effects in the atmosphere, in terrestrial ecosystems, in freshwater and marine systems, and on human health. The result is a wide variety of beneficial and detrimental changes in the health and welfare of people and ecosystems. Information to date indicates reactive nitrogen is accumulating in the environment.

Anthropogenic activity leading to production of reactive nitrogen has been shown to exceed that from natural systems. Circulation of reactive nitrogen in the atmosphere, hydrosphere and biosphere of the Earth has a wide variety of consequences that are magnified with time as reactive nitrogen moves along its biogeochemical pathway. Furthermore, research indicates the influence of reactive nitrogen in the environment should be considered from a systems perspective and integrated across environmental media. For example, reactive nitrogen that produces urban air pollution can also contribute to water pollution and the extensive use of nitrogen-containing materials in a watershed has a strong impact on the health of the associated coastal zone. Accordingly, there is a need to assess the extent of linkage among the effects that nitrogen causes in the environment, and to explore the implications of these linkages for nitrogen research and risk management.

The EPA Science Advisory Board (SAB) was established by 42 U.S.C. 4365 to provide independent scientific and technical advice, consultation, and recommendations to the EPA Administrator on the technical bases for EPA policies and regulations. It is the initial assessment of the SAB that EPA's research programs on Nr could be better integrated. The SAB is conducting a study to assess the degree of integration among the current EPA programs, to make recommendations for a more integrated research program on Nr, and to identify opportunities for a more integrated approach to nitrogen management. To carry out the Integrated Nitrogen Research Project, the SAB is forming an Ad Hoc Committee, known as the Integrated Nitrogen Research Committee.

The Staff Office is soliciting nominations for members of the new Committee. The Committee will provide advice through the chartered SAB. The Committee will comply with the provisions of the Federal Advisory Committee Act (FACA) and all appropriate SAB Staff Office procedural policies. The Committee will address the following questions: 1. What are the nitrogen problems? 2. What are the linkages among/between the different nitrogen problems? 3. What EPA environmental programs and policies could provide the greatest control of nitrogen? What are the benefits of integrated nitrogen management? 4. What are the research needs to better understand the nitrogen problems and to strengthen the integrated risk management of nitrogen?

To achieve these overall goals, the SAB plans to conduct a number of workshops and issue reports for this study. Nomination of Candidates for SAB Committee The SAB Staff Office is soliciting public nominations of nationally and internationally recognized scientists with expertise in one or more of the following areas: Biogeochemistry and Effects (1) The sources of Nr released into the environment from human activities and natural sources, including: Intentional cultivation of crops which promote conversion of nitrogen gas to organic nitrogen; combustion of fossil fuels; and the Haber-Bosch process. (2) The behavior and effects of Nr in the atmosphere, including tropospheric ozone, particulate matter and visibility, and greenhouse gases and stratospheric ozone. (3) The behavior and effects of Nr on humans and ecosystems in the terrestrial environment, including grassland/forest and agroecosystem. (4) The behavior and effects of nitrogen in the aquatic environment, including wetlands, groundwater, surface waters, estuarine, coastal and marine environments. Risk Reduction (5) Risk Reduction Approaches including implementation of regulatory and voluntary approaches to risk reduction. Control (6) Specific control technologies or practices, including combustion controls for nitrogen oxides, ozone precursors, and particulate matter/visibility and practices for controlling ammonia in agriculture.

Process and Deadline for Submitting Nominations: Any interested person or organization may nominate qualified experts from academia, industry, non-governmental organizations or State, local and tribal governments in the areas of expertise described above to serve on the Committee. Nominations should be submitted in electronic format through the Form for Nominating Individuals to Panels of the EPA Science Advisory Board provided on the SAB Web site at: <http://www.epa.gov/sab>. The form can be accessed through a link on the blue navigational bar at that Web site. To be considered, nominations must include all the information required on that form. Anyone who is unable to submit nominations electronically using this form, or who has questions concerning the nomination process may contact Ms. [[Page 12477]] Kathleen White, DFO, as indicated above in this notice. Nominations should be submitted in time to arrive no later than April 11, 2005.

To be considered, all nominations must include: (a) a current biography, curriculum vitae (C.V.) or resume, which provides the nominee's background, experience and qualifications for the Committee; and (b) a brief biographical sketch ("biosketch"). The biosketch should be no longer than one page and must contain the following information for the nominee: (i) Current professional affiliations and positions held; (ii) Area(s) of expertise, and research activities and interests; (iii) Leadership positions in national associations or professional publications or other significant distinctions; (iv) Educational background, especially advanced degrees, including when and from which institutions these were granted; (v) Service on other advisory committees, professional societies, especially those associated with issues under discussion in this review; and (vi) Sources of recent (i.e., within the preceding two years) grant and/or other contract support, from government, industry, academia, etc., including the topic area of the funded activity. Please note that even if there is no responsive information (e.g., no recent grant or contract funding), this must be indicated on the biosketch (by "N/A" or "None"). Incomplete biosketches will result in nomination packages not being accepted. The EPA SAB Staff Office will acknowledge receipt of the nomination.

After considering the nominees (termed the ``Widecast"), the SAB Staff Office will identify a subset (known as the ``Short List") for more detailed consideration. Criteria used by the Staff Office in developing this Short List are given at the end of the following paragraph. The Short List will be posted on the SAB Web site at: <http://www.epa.gov/sab>, and will include the nominees' names and their biosketches. Public comments will be accepted for 21 calendar days on the Short List. During this comment period, the public may provide information, analysis or other documentation on nominees that the Staff Office should consider in evaluating candidates for the Committee.

For the EPA SAB Staff Office, a balanced Committee is characterized by inclusion of candidates who possess the necessary domains of knowledge, the relevant scientific perspectives (which, among other factors, can be influenced by work history and affiliation), and the collective breadth of experience to adequately address the charge. Public responses to the Short List candidates will be considered in the selection of the Committee, along with information provided by candidates and information independently-gathered by the SAB Staff Office on the background of each candidate (e.g., financial disclosure information and computer searches to evaluate a nominee's prior involvement with the topic under review). Specific criteria to be used in evaluating an individual Committee member include: (a) Scientific and/or technical expertise, knowledge, and experience (primary factors); (b) availability and willingness to serve; (c) absence of financial conflicts of interest; (d) scientific credibility and impartiality; and (e) skills working in advisory committees, subcommittees and review panels.

Short List candidates must submit the ``Confidential Financial Disclosure Form for Special Government Employees Serving on Federal Advisory Committees at the U.S. Environmental Protection Agency" (EPA Form 3110-48). This confidential form allows Government officials to determine whether there is a statutory conflict between that person's public responsibilities (which includes membership on an EPA Federal advisory committee) and private interests and activities, or the appearance of a lack of impartiality, as defined by Federal regulation. The form may be viewed and downloaded from the following URL address: <http://www.epa.gov/sab/pdf/epaform3110-48.pdf>.

The approved policy under which the EPA SAB Office selects ad hoc committees and review panels is described in the following document: Overview of the Panel Formation Process at the Environmental Protection Agency Science Advisory Board (EPA-SAB-EC-02-010), which is on the SAB Web site at: (<http://www.epa.gov/sab>) <http://www.epa.gov/sab/ecm02003.pdf> <http://www.epa.gov/sab/pdf/ec02010.pdf>. Dated: March 4, 2005. Vanessa T. Vu, Director, EPA Science Advisory Board Staff Office.

**Invitation for Comments on the “Short List” Candidates for the
Ad hoc Integrated Nitrogen Research Committee
of the EPA Science Advisory Board (SAB)
August 21, 2006**

The EPA Science Advisory Board (SAB) Staff Office is forming a new *ad hoc* Integrated Nitrogen Research Committee. Nominations were requested in the 70 FR no. 48, (pages 12476-12477), March 14, 2005. Information on the SAB, the *ad hoc* Committee, and the nomination process appear in the above referenced Federal Register notice which is available at the SAB website (<http://www.epa.gov/fedrgstr/EPA-SAB/2005/March/Day-14/sab4960.htm>). Per the *Federal Register* notice, the SAB Staff Office requested nominees who were nationally recognized experts in one or more of the following areas:

- (1) The sources of reactive nitrogen released into the environment from human activities and natural sources, including: intentional cultivation of crops which promote conversion of nitrogen gas to organic nitrogen; combustion of fossil fuels; and the Haber-Bosch process.
- (2) The behavior and effects of reactive nitrogen in the atmosphere, including tropospheric ozone, particulate matter and visibility, and greenhouse gases and stratospheric ozone.
- (3) The behavior and effects of reactive nitrogen on humans and ecosystems in the terrestrial environment, including grassland/forest and agroecosystem.
- (4) The behavior and effects of reactive nitrogen in the aquatic environment, including wetlands, groundwater, surface waters, estuarine, coastal and marine environments.
- (5) Risk Reduction Approaches including implementation of regulatory and voluntary approaches to risk reduction.
- (6) Specific control technologies or practices, including combustion controls for nitrogen oxides, ozone precursors, and particulate matter/visibility and practices for controlling ammonia in agriculture.

The SAB Staff Office has reviewed the nominations for the Panel and has identified 51 candidates for potential service on the *ad hoc* Integrated Nitrogen Research Committee. We hereby invite comments from members of the public for relevant information or other documentation that the SAB Staff Office should consider in the selection of this Committee.

The SAB Staff Office reviews all information provided by candidates; information that the public may provide in response to the posting of information about the candidates at the SAB website, and information gathered by the SAB Staff independently on the background of the candidates. The SAB Staff completes its review of information regarding conflict of interest, possible appearance of a lack of impartiality, and appropriate balance and breadth of expertise needed for the Committee's activities. The SAB Staff Office Director will make the final decision about who will serve on the Committee.

Please email your comments no later than **September 12, 2006** to the attention of Ms. Kathleen White, Designated Federal Officer (white.kathleen@epa.gov).

Dr. Mark Alley is W.G. Wysor Professor of Agriculture in the Dept. of Crop & Soil Environmental Sciences at Virginia Tech, Blacksburg, VA. He received a B.S. Degree in Agriculture from Berea College, Berea, KY, 1969, an M.S. Degree in Agronomy, Virginia Polytechnic Inst. & State University in 1971 (Thesis Title: Evaluation and Calibration of Soil Tests for Available Zinc), and a Ph.D. Degree in Agronomy from Virginia Polytechnic Inst. & State University in 1975. (Dissertation Title: Manganese in Virginia Soils and Correction of Manganese Deficiency in Soybeans.) His research interests include nitrogen cycling and management in agronomic cropping systems involving corn, soybeans, wheat and barley. He teaches undergraduate and graduate courses in soil fertility and soil-plant relationships. In addition, he serves as an advisor to the Virginia Division of Soil and Water Conservation on matters relating to nutrient management in crop production, and his extension activities focus on training and support of county agents and agribusiness representatives. His honors and awards include International Fertilizer Industry Association International Award for 2002, Virginia Agribusiness Council 2001 Extension Service Award, W. G. Wysor Professor of Agriculture, Jan. 1, 1999. Endowed Professorship, National Association of Wheat Growers Excellence in Extension Award - 1996, American Society of Agronomy Fellow - 1996, Soil Science Society of America Fellow - 1995, Virginia Small Grains Association Research Award --1992.

Dr. Viney Aneja is a Professor in the Department of Marine Earth and Atmospheric Sciences at North Carolina State University. He holds the following degrees: B. Tech. 1971 Indian Institute of Technology, Kanpur, India, Major: Chemical Engineering; M.S. 1975 North Carolina State University, Raleigh, NC, Major: Chemical Engineering; PhD 1977 North Carolina State University, Raleigh, NC, Major: Chemical Engineering and Minor: Polymer Science and Operations Research; and MBA 1986 Union College, Schenectady, NY, Major: Planning and Control. His areas of professional interest are: air quality and atmospheric chemistry: transport, transformation and fate of pollutants; natural emissions of trace gases (Nitrogen, Sulfur, and Hydrocarbons); biogeochemical cycling of pollutants; atmospheric monitoring of trace gases; biospheric-atmospheric interactions; photochemical oxidants and gas-to-particle conversion. His research has been funded by the U.S Environmental Protection Agency; National Science Foundation; US Department of Agriculture; National Research Initiative; National Park Service; National Oceanic and Atmospheric Administration; University Corporation for Atmospheric Research; NC Department of Environment and Natural Resources; NC State University Animal and Poultry Waste Management Center; Phosphate and Potash Institute; The Fertilizer Institute; Kenan Institute for Engineering, Technology, and Science; and others. He is a member of the U.S. Department of Agriculture's Agricultural Air Quality Task Force. He has lead the State of North Carolina's Nitrogen Emissions, Transport, Transformation, and Deposition effort since 1997, and has successfully organized two International Conferences on Nitrogen related issues. In 2001 he was appointed Program Scientist and Principal Investigator for the Animal and Poultry Waste Management Center/ Smithfield Foods funded Program OPEN (Odor, Pathogens, and Emissions of Nitrogen). During 2006 he organized and chaired the Steering Committee for the first "Workshop on Agricultural Air Quality: State of the

Science". Dr. Aneja has published numerous scientific peer reviewed papers on the subject; and was invited to offer testimony to the North Carolina General Assembly on the impact of increasing Nitrogen in North Carolina's environment. Dr. Aneja is highly respected by his peers as demonstrated by his receipt of the Air and Waste Management Association's 1998 Frank A. Chambers Award (AWMA's highest honor) and the 2001 Lyman A. Ripperton Award (for distinguished achievement as an educator in the field of air pollution). He is the Associate Editor of the International Journal "Air Quality, Atmospheric Environment and Health", and serves on the Editorial Boards of numerous International Journals.

Dr. Thomas W. Asmus does consulting, serves as adjunct faculty at the University of Michigan, and is an active volunteer. Formerly, he was Senior Research Executive at DaimlerChrysler Corporation in Auburn Hills, Michigan. He earned a BS from Western Michigan University, to which he returned after serving for two years in the Peace Corps in Honduras. He then earned an M.S. and Ph.D. in Physical Chemistry from Western Michigan and did a post-doc in combustion kinetics at Drexel. In his career, Dr. Asmus addressed the combustion component of engine research and related issues such as fuel efficiency and emissions (including NOx). He is knowledgeable about alternative combustion systems. He was elected a member of the National Academy of Engineering in recognition of his contributions to the design, analysis, and control of heat engines of all types. He is a fellow of the Society of Automotive Engineering, and a member of the American Society of Mechanical Engineers.

Dr. William D. Bowman is Professor, Department of Ecology and Evolutionary Biology and Director, Mountain Research Station, INSTAAR at the University of Colorado. He received his B.A., with distinction from the University of Colorado, an M.S. in ecology from San Diego State University, and a Ph.D. in Botany from Duke University. He did postdocs at Australian National University and Duke University. His areas of expertise and research activities include plant ecology, ecosystems science, alpine ecology, and ecosystem response to N deposition. He has worked on terrestrial ecosystem responses to N deposition on Niwot Ridge and Rocky Mountain National Park in the southern Rockies, Glacier National Park in the northern Rockies, and in the Tatra Mountains of Slovakia. From 1998 to 2005 he served as the North American Representative to the Conference Board of the Global Mountain Biodiversity Assessment, a program within DIVERSITAS, sponsored by the Swiss Academy of Sciences, He has served on advisory committees for National Park Service, U.S. Forest Service, Indiana University Geological Field Station, and the NSF-LTER site review team. He is a member of Ecological Society of America, Organization of Biological Field Stations, American Institute of Biological Sciences.

Dr. Elizabeth W. Boyer is an Assistant Professor in the Department of Environmental Science, Policy & Management at the University of California, Berkeley. She holds a B.S. degree from Penn State University in the Department of Geography (concentration

in remote sensing and geographic information), M.S. and Ph.D. degrees from the University of Virginia in the Department of Environmental Sciences (concentration in hydrology), and post-doctoral experience at Cornell University in the Program in Biogeochemistry & Environmental Change. Prior to her current position, she served on the faculty at the State University of New York's College of Environmental Science and Forestry, and has held adjunct positions at Cornell University and at Syracuse University. Dr. Boyer's research program addresses coupled hydrological and ecological processes that affect water quality (particularly nutrients & sediments) and water quantity (streamflow and water yield) issuing from watersheds. She is interested in how human activities such as land use change and urbanization and natural variability such as droughts and floods influence ecosystems and water quality conditions in surface waters. She is the co-chair of the upcoming Gordon Conference on Catchment Science: Interactions of Hydrology, Biology and Geochemistry, and is an active participant in activities of the American Geophysical Union and the Consortium of Universities for the Advancement of Hydrologic Science.

Dr. Patrick Brezonik is program director for environmental engineering at the National Science Foundation. His research interests are focused on the impacts of human activity on water quality and the biogeochemical cycles of important elements (nitrogen, phosphorus, trace metals) in large natural systems—watersheds and lakes. Field studies, including experimental manipulations in large systems, and modeling approaches are emphasized. His current research projects are in four main areas: (1) mercury biogeochemistry; (2) applications of satellite imagery to evaluate lake quality; (3) coupled biogeochemical cycles of carbon, nitrogen and phosphorus in urban and agricultural systems; and (4) small-scale nutrient cycling processes in soil-sediment-water systems. His mercury research is concerned with chemical transformations of mercury in wetland-lake ecosystems, with emphasis on photochemical processes and interactions between mercury forms and natural organic matter (humic substances) in these water bodies. My work with satellite imagery focuses on regional analyses and long-term trend assessments of trophic state conditions in lakes by use of Landsat and new satellite platforms. Our work on coupled biogeochemical cycles of the major elements is highly interdisciplinary and involves comparative analyses at the regional scale of nutrient budgets for urban, agricultural and natural regions in the Twin Cities and Phoenix (Arizona) metropolitan areas. Quantifying the importance of denitrification as a nitrogen sink in small agricultural streams is an example of a current project in the fourth area. Some of this research is conducted through large multi-disciplinary projects. For example, the experimental acidification of a whole lake in northern Wisconsin was done in cooperation with limnologists, fisheries biologists, and hydrologists from several institutions and agencies. Recent research has been conducted in a variety of locations, including Lake Okeechobee, Florida, urban lakes in the Twin Cities and pristine lakes in northern Michigan, Wisconsin, and Minnesota. He holds the following degrees: B.S., 1963, Chemistry, Marquette University, M.S., 1965, Water Chemistry, University of Wisconsin-Madison, and Ph.D., 1968, Water Chemistry, University of Wisconsin-Madison

He served as Assistant, Associate, and Full Professor, Department of Environmental Engineering Sciences at the University of Florida from 1966-81 and Guest Professor at EAWAG-Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland, 1971-72 and summer, 1980

Dr. Richard G. Carlton manages the Electric Power Research Institute's Integrated Facilities Water Management Program, and is responsible for strategic planning and project management. Research emphases in the Program include novel approaches to managing nitrogen in waste streams, ash pond management (with emphasis on nitrogen and metals removal), dry and low water cooling technologies, non-oxidizing biocides for cooling systems, plant water treatment, and constructed wetlands for waste water treatment. Other responsibilities include program and project direction, interaction with customers in and out of the power sector, and assistance to specific utilities to develop tailored solutions to emerging problems. Dr. Carlton manages research in diverse areas, including 1) avian interactions with power transmission and distribution structures, wind power facilities, and communication towers; 2) sources and fates of atmospheric nitrogen deposition; 3) development of regional nutrient trading schemes to reduce eutrophication of waterways, 4) peregrine falcon nesting on power plant stacks; 4) food-borne mercury exposure in the common loon; 5) release of pollutants from contaminated sediments; and 6) mercury and selenium cycling and food chain transfer in terrestrial and aquatic ecosystems. He is a member of the American Society for Limnology and Oceanography, the Societas Internationalis Limnologiae, and the Society for Environmental Toxicology and Chemistry. His educational background includes a B.S. in Limnology from the University of California, Davis; an M.S. in Ecology from the University of California, Davis; and a Ph.D. in Zoology from Michigan State University. His areas of expertise are the biogeochemistry of nitrogen, phosphorus, mercury, selenium; treatment of nitrogenous waste streams; nitrogen emissions and discharges from coal-fired power plants. He served as major professor and advisor for PhD and MS students while serving as professor at the University of Notre Dame.

Dr. Kenneth G. Cassman currently serves as Director of the Nebraska Center for Energy Sciences, and is the B. Keith and Norma F. Heuermann Professor of Agronomy at the University of Nebraska. He received a BSc degree in biology from the University of California--San Diego (1975), and a PhD in Agronomy and Soil Science from the University of Hawaii (1979). His expertise is centered within the disciplines of soil science, agroecology, and plant ecophysiology. Research activities have focused on: (1) plant nutrition, root ecophysiology, soil fertility and nutrient cycling to improve fertilizer efficiency and to reduce negative effects on environmental quality; (2) crop yield potential, soil carbon sequestration, and greenhouse gas emissions in maize-based cropping systems of the USA Corn Belt; (3) the long-term sustainability of intensive crop production systems and global food security. Recently he has focused attention on the role of agriculture in contributing to renewable energy supplies through production of ethanol and biodiesel fuels from cereal, oilseed, and sugar crops, and the environmental impact of expanded biofuel production from agricultural crops. He

served on the California Task Force on Sustainable Agriculture (1985-86), the Board of Directors for the Nebraska Crop Improvement Association (1996-2004), the Nebraska Crop Advisors Executive Board (1996-2002), the Council on Agriculture Science and Technology (CAST) Task Force on Animal Agriculture and Global Food Security (1996-99), Chair of the Nebraska Environmental Livestock Environmental Quality Task force (1998-2001), and on the Science and Policy Committee for the 3rd International Nitrogen Conference (2003-04). In addition, he has been active as an external program reviewer for a number of major scientific institutions, including: CIMMYT (1997 and 2000), IITA (2001), the graduate program at the Wageningen Agricultural University in the Netherlands (1998), and the Department of Soil Science at the University of Wisconsin. In the past 11 years he and his colleagues have obtained more than \$6 million to support their research and extension programs. This external funding has come a number of sources: the USDA, DOE, Swiss Agency for Development and Cooperation, German Agency for Science and Technology, the Potash and Phosphate Institute, Foundation for Agronomic Research, and the Fluid Fertilizer Foundation. Professor Cassman has been elected Fellow of the American Association for the Advancement of Science, the Agronomy Association of America, the Soil Science Society of America, and the Crop Science Society of America, and has received a number of national and international awards for research excellence.

Dr. Nicholas B. Comerford is Professor of Forest Soils and Graduate Coordinator in the Soil and Water Science Department at the University of Florida. He holds a B.S. from the University of Illinois (Forestry), an M.S. from the University of Minnesota (Forestry), and a Ph.D. from the State University of New York – Syracuse (Forestry). His professional Interests are in the areas of forest soils, optimizing soil management in forest operations, soil-tree root- soil interactions, modeling of soil nutrient bioavailability, soil P cycling and chemistry, and soil environmental services in the Tropics and Southeastern U.S. His teaching includes a graduate course in Soil Nutrient Bioavailability, occasional Graduate Seminars in Tropical Soils and a new course to be offered on Soil Environmental Services. He belongs to the Soil Science Society of America, Sociedade Brasileira de Ciência do Solo, and the The Fulbright Association.

Dr. Mark B. David is Professor of Biogeochemistry in the Department of Natural Resources and Environmental Sciences at the University of Illinois at Urbana-Champaign, where he has conducted research and teaching since 1985. He received his Ph.D. in environmental science/biogeochemistry from the State University of New York, College of Environmental Science and Forestry in 1983, following an M.S. from the University of Maine in 1980 (forest biogeochemistry), and B.S. from the Pennsylvania State University in 1978 (forest science). His area of expertise is the biogeochemistry of nutrients in agricultural, forested, and aquatic ecosystems. Dr. David was named a Fellow of the Soil Science Society of America in 2005 and a Fellow of the American Society of Agronomy in 2006 (the highest honor of each of the societies), his two primary professional societies. He is also a member of the Ecological Society of America. Based on the extensive citations his publications have received (about 100

peer reviewed journal articles), Dr. David is listed as an ISI Highly Cited Researcher, Ecology/Environment. His recent and current research program is focused on agricultural and aquatic biogeochemistry of nitrogen and phosphorus, including linkages between agricultural and aquatic systems. He has studied nitrogen transformations and export at agricultural field, watershed, and regional scales; examined the use of wetlands for reducing downstream nutrient losses; and has been evaluating the interactions of nutrients (nitrogen and phosphorus), algal growth, and dissolved oxygen with resulting impacts on biotic integrity in Illinois streams and rivers. Currently Dr. David is an associate editor for the Journal of Environmental Quality, and previously served six years as associate editor of the Soil Science Society of America Journal. He has served on numerous USDA proposal review panels, an NSF Biocomplexity panel, and has been sought out and participated in many recent national and international workshops related to nitrogen, agriculture, and stream export. National and state competitive grants have supported his recent biogeochemistry research in Illinois and the Midwest, including USDA-NRI Watershed Processes and Water Resources Program, USDA 406 Water Quality program, NSF Biocomplexity in the Environment Coupled Human/Natural Cycles, and the Illinois Council for Food and Agricultural Research.

Dr. John W. Day, Jr. is Distinguished Professor Emeritus in the Department of Oceanography and Coastal Sciences, School of the Coast & Environment at Louisiana State University, where he has taught since 1971. He has published extensively on the ecology and management of coastal and wetland systems and has over 150 peer-reviewed publications. He is co-author (with M. Kemp, C. Hall, and A. Yáñez-Arancibia) of *Estuarine Ecology*, coeditor (with C. Hall) of *Ecological Modeling in Theory and Practice*, coeditor (with W. Conner) of *The Ecology of the Barataria Basin, An Estuarine Profile*, and coeditor (with A. Yáñez-Arancibia) of *the Ecology of Coastal Ecosystems in the Southern Mexico: The Terminos Lagoon Region*. Professor Day received his PhD in marine sciences and environmental sciences from the University of North Carolina in 1971 working with Dr. H.T. Odum. Since then, he has conducted extensive research on the ecology and management of the Mississippi Delta region and for the last 25 years, he has studied coastal ecosystems in Mexico. He was a visiting professor in the Institute of Marine Sciences of the National University of Mexico in 1978-1979, at the University of Utrecht in the Netherlands during 1986, at the Laboratoire d'Ecologie, Université Claude Bernard in Arles France during 1992-93, and in the Department of Geography at Cambridge University in 2000-2001. He has also worked with the University of Campeche and the Institute of Ecology in Xalapa, Mexico. Since 1992, Professor Day has worked in the Mediterranean studying the impacts of climate change on wetlands in Venice Lagoon and in the Po, Rhone and Ebro deltas. He is presently working on using wetlands as a means of removing nitrogen from the Mississippi River. Dr. Day also served as a member of the hypoxia reassessment taskforce and published with Dr. William Mitsch an article in *BioScience* on approaches to removing nitrogen from the Mississippi River. He has served as chair of the National Technical Review Committee that oversaw the Louisiana Coastal Area program, the restoration program for the Mississippi delta. Dr. Day was a member of the Science Working Group on

Coastal Forested Wetlands appointed by the Governor of Louisiana, and the Working Group for Post-Hurricane Planning for the Louisiana Coast established by the Headquarters of the Corps of Engineers. In 1988, Dr. Day received the School of the Coast & Environment Outstanding Faculty Teaching Award and in 2000, he received the Lipsey Professional Educator Award. In 2003, the Estuarine Research Federation presented Dr. Day with the National William A. Niering Education Award.

Dr. Jorge A. Delgado is a Soil Scientist in the Soil-Plant-Nutrient Research Unit, of the U.S. Department of Agriculture's Agricultural Research Service in; Fort Collins, CO. He holds a B.S. Soil Science from the University of Puerto Rico; an M.S. Agronomy from the Louisiana State University; and a Ph.D. Soil Fertility/Mineral Nutrition from the Louisiana State University. He did a Post Doc in Biogeochemistry at USDA-ARS, Colorado. Dr. Delgado is an expert in nitrogen management and in the use of isotopes, biogeochemistry, and nitrogen fate and transport. He made important contributions in the areas of site specific and regional scale evaluations of best management practices on nitrogen fate and transport, and nitrogen use efficiencies. He established an international network of experts to evaluate and implement new tools such as GIS, Nitrogen Index and nitrogen models to assess effects of high risk cropping systems/landscape combinations to reduce leaching losses and to increase nitrogen use efficiencies. He developed and published a new nitrogen Index to assess the effects of management practices on surface, atmospheric and leaching losses. He is a member of the Soil Science Society of America, (since 1986); Soil Water Conservation Society, (since 1995); Agronomy Society of America, (since 1986); Sigma Xi, (since 2002); Gamma Sigma Delta, (since 1982); Alpha Zeta, (since 1981); Puerto Rico Society of Agronomy, (since 1982). Dr. Delgado was Chair of the Soil Science Society of America, Division of Soil and Water Management and Conservation, (2003-2004). Currently, he is Research Editor of the Journal of Soil and Water Conservation, (2001-2009) and the Chair of the Soil Water Conservation Society Editorial Board, (2001-2009). He has overseen the peer review of 400+ manuscripts during the last four years. He has led or co-led the organization of over 12 national and international symposiums and the publication of four symposiums in special peer review journal issues during the last six years. He has been awarded presidential citations by both the SWCS and SSSA. He has authored or co-authored the publication of 80+ papers related to nitrogen (50+ during the last five years). He was invited to conduct several national and international presentations about nitrogen management and nitrogen fate and transport. He has had visiting scientists from several countries working in nitrogen management in his laboratory, and has ongoing research cooperation with scientists from China, Mexico, Argentina, Switzerland, and elsewhere. Dr. Delgado has been awarded Fellow Awards of the Soil Science Society of America (November-2005), Soil and Water Conservation Society (July-2006) and Agronomy Society of America (November-2006). Dr. Delgado was invited to form part of a USA national working group composed of USDA-NRCS and state universities to develop a new generation of the nitrogen index. He is the leader and facilitator of the Nitrate Leaching sub-group. He has served on several peer review panels that have granted over 20 million dollars into natural resources, soil science, and other environmental areas. He has served as graduate

advisor for CSU students studying and researching nitrogen management practices and technology.

Dr. Russell R. Dickerson received his AB in 1975 from the University of Chicago and his Ph.D. in 1980 from The University of Michigan, where he studied the interaction of radiation and trace gases in the atmosphere. Starting as Assistant Professor in the Department of Meteorology he is currently the Department Chair, with affiliate appointments in ESSIC and the Departments of Chemistry and Chemical Physics. Dr. Dickerson's research involves the interactions of weather phenomena, such as thunderstorms and atmospheric chemistry, ocean-atmosphere interactions, air pollution, the links between particulate and gaseous chemistry, photochemical smog, and haze. He has been involved in international chemistry/climate field experiments spanning the globe – from the Southern Indian Ocean to the Arctic. He has written more than 80 publications for the reviewed scientific literature. For the past ten years Dr. Dickerson has collaborated closely with the Maryland Department of the Environment on the Regional Atmospheric Measurement, Modeling and Prediction Program (RAMMPP) which makes air quality forecasts, determines emissions, runs chemical transport models, and makes measurements from the surface as well as aircraft to help develop the scientific basis for strategies to improve air quality including State Implementation Plans.

Dr. Otto C. Doering received his BA from Cornell University, M.Sc. (Econ.) from the London School of Economics and his Ph.D. from Cornell University. He has teaching, research and extension responsibilities in the Department of Agricultural Economics at Purdue University. He has overseas experience with the Ford Foundation and the National Academy of Sciences, primarily in Southeast Asia. He has been a visiting professor at Berkeley, Cornell, and North Carolina A&T State University. He is a National Science Foundation evaluator for the NSF Industry/University Cooperative Research Program. He is a public policy specialist and has served the U.S. Department of Agriculture working on the 1977 and 1990 Farm Bills. In 1997 he was the Principal Advisor to USDA's Natural Resources Conservation Service for implementing the 1996 Farm Bill. From 1985 to 1990 he was director of Indiana's State Utility Forecasting Group. In 1999, he was team leader for the economic analysis of the White House's National Hypoxia Assessment that looked at the dead zone in the Gulf of Mexico. Dr. Doering has served on Indiana's Commission for Higher Education. He has been a Director and is President Elect of the American Agricultural Economics Association and Chairman of the National Public Policy Education Committee. He has twice received the AAEA's Distinguished Policy Contribution Award as well as its Extension Economics Teaching Award. He is a member of the American Association for the Advancement of Science, the International Society for Ecological Economics, and American Society of Agricultural and Biological Engineers. In a previous life he worked as a horse wrangler and a legal investigator. Professor Doering teaches The Economic Geography of World Food and Resources to undergraduates and the Department's research methods class to graduate students. His recent publications include a book on the 1996 Farm Bill

and a book on the effects of climate change and variability on agricultural production systems. Recent publications focus on economic linkages driving the response to nitrogen over-enrichment, the rationale for U. S. agricultural policy, and integrating biomass energy into existing energy systems.

Dr. Charles T. Driscoll is the University Professor of Environmental Systems Engineering at Syracuse University. Dr. Driscoll received his B.S. degree in Civil Engineering from the University of Maine in 1974, and his M.S. in 1976 and Ph.D. in 1980 in Environmental Engineering from Cornell University. Dr. Driscoll's teaching and research interests are in the areas of environmental engineering, environmental chemistry, biogeochemistry and environmental quality modeling. A principal research focus of Dr. Driscoll's research has been the effects of disturbance on forest, aquatic and coastal ecosystems, including air pollution (acid rain, mercury), land-use change and elevated inputs of nutrients and trace metals. Dr. Driscoll uses a variety of research approaches to study these perturbations, including field investigations, laboratory studies, long-term field measurements, whole-ecosystem manipulations, and the development and application of models. Dr. Driscoll has authored or co-authored more than 275 peer-reviewed articles and has been acknowledged by the Institute for Scientific Information (ISI) as one of the most highly cited researchers in both engineering and environmental science. He has received external funding for more than 70 research projects, mostly obtained from competitive research programs such as the National Science Foundation and the Environmental Protection Agency. He is currently the principal investigator of the National Science Foundation's Long-Term Ecological Research project at the Hubbard Brook Experimental Forest, New Hampshire. In 1984, the National Science Foundation designated Dr. Driscoll as a Presidential Young Investigator. He has provided expert testimony to U.S. Congressional and State committees. Dr. Driscoll has served on many local, national and international committees, including the National Research Council Panel on Process of Lake Acidification, the Committee of Air Quality Management, and the Committee on CLEANER and NSF's Environmental Observations.

Dr. Ivan Fernandez is a professor and forest soils scientist at the University of Maine, Orono. His expertise is in nutrient and metal cycling in forested ecosystems, particularly in soil biogeochemical responses to ecosystem disturbance. He publishes regularly in professional journals on a multi-media range of subjects pertaining to forest ecology including soil biogeochemistry, nutrient cycling, acid deposition and climate change effects on forests, watershed processes and soil ecology. He has also published numerous technical reports, book chapters, and a book. He is a member of numerous professional organizations such as the Society of American Foresters, Soil Science Society of America, National Association of Environmental Professionals and the Soil and Water Conservation Society to name a few. He serves as a member of the national Council of Soil Science Examiners, the Maine Board of Certification for Professional Geologists and Soil Scientists, and is responsible for oversight of the long-term whole ecosystem research program at the Bear Brook Watershed in Maine. His research

interests are in atmospheric deposition and climate change effects on forested ecosystems and watershed processes, as well as the ecological impact of residuals utilization in forests. Current research projects include studies of long-term watershed acidification, base cation depletion, nitrogen saturation, municipal residuals utilization in forests, and the effects of fire and climate on mercury and nitrogen dynamics.

Ms. Suzanne Fisher is an environmental scientist in the Research and Technology Applications division at the Tennessee Valley Authority. She holds a B.S. in Ecology and Evolutionary Biology from the University of Tennessee and a M.S. in Environmental Health from East Tennessee State University. Her expertise is focused on the relationships between anthropogenic activities and ecosystem functions and processes including nitrogen saturation, carbon sequestration in degraded mine lands, acidic deposition, biogeochemical dynamics in forest ecosystems, and long-term chemical and growth trends through the application of dendrochemistry. Current research projects include studies of nitrogen saturation in the southern Appalachians, nitrogen critical loads in the Great Smoky Mountains National Park, impacts to nitrogen cycling and stream water quality caused by Hemlock Woolly Adelgid-induced hemlock mortality in Great Smoky Mountains National Park, and dendrochemical mercury investigations. She has published in peer-reviewed journals and is a member of professional organizations such as the Society of Environmental Toxicology and Chemistry, the Soil Science Society of America, and the Tree Ring Society. Her research is fully supported by the Tennessee Valley Authority and the Electric Power Research Institute.

Dr. Patrick F. Flynn retired as Vice President of Research for the Cummins Engine Company, Inc. after thirty years of service. His duties there included: responsibility for the direction of the corporation's efforts in combustion research and development on diesel and alternate fueled engines, development and support of engineering computational capabilities, development and support of corporate emissions test capability (including product support, certification, and audits, for diesel and alternate fueled engines). The University of Minnesota granted him a B.S. and M.S. in Agricultural Engineering. He has an MBA from Indiana University and earned a Ph.D. in Mechanical Engineering with a Minor, in Physical Metallurgy from the University of Wisconsin. He is a Registered Professional Engineer in the State of Indiana. Dr. Flynn is a member of the National Academy of Engineering; he was elected for advances in diesel engine design utilizing science-based methodology. He is a Fellow of the Society of Automotive Engineers and the American Society of Mechanical Engineers. He is a two time recipient of the Arch T. Colwell Merit Award for Outstanding Contribution to Society of Automotive Engineering Literature and a recipient of the National Society of Professional Engineers's Outstanding Engineer Award. He has served on many advisory groups. He was a member of the Board on Army Science and Technology, National Academy of Engineering, of the National Research Council, Chinese Academy of Engineering, and National Academy of Engineering Committee study on "Personal Cars And China", and of the Board of Directors for the Center for Engine Research at the University of Minnesota. He chaired the National Research

Council Committee on Soldier Power/Energy Systems of the Board on Army Science and Technology, "Meeting the Energy Needs of FUTURE WARRIORS".

Dr. James N. Galloway is Professor of Environmental Sciences at the University of Virginia. Dr. Galloway received his B.A. degree in Chemistry and Biology from Whittier College in 1966 and the Ph.D. degree in Chemistry from the University of California, San Diego in 1972. Following a postdoctoral appointment with Gene Likens at Cornell University, he accepted a position as Assistant Professor of Environmental Sciences at the University of Virginia in 1976. He served as President of the Bermuda Biological Station for Research from 1988 to 1995, and as chair of Environmental Sciences, University of Virginia from 1996 to 2001. He is the chair of the International Nitrogen Initiative, a program sponsored by SCOPE and IGBP, and is a member of the EPA Science Advisory Board. In 2002 he was elected a Fellow of the American Association for the Advancement of Science. His research on biogeochemistry includes the natural and anthropogenic controls on chemical cycles at the watershed, regional and global scales. His current research focuses on beneficial and detrimental effects of reactive nitrogen as it cascades between the atmosphere, terrestrial ecosystems and freshwater and marine ecosystems.

Dr. Peter M. Groffman is currently a Senior Scientist at the Institute of Ecosystem Studies in Millbrook, NY; with research interests in ecosystem, landscape and microbial ecology, with a focus on carbon and nitrogen dynamics. He received his Ph.D in 1984 in Ecology from the University of Georgia. Specific recent research efforts include investigation of; the effects of atmospheric nitrogen deposition on nitrogen gas fluxes (EPA STAR Grant), nitrate dynamics in riparian buffer zones (USDA NRICGP, EPA), snow depth as a regulator of soil freezing and nitrogen dynamics (NSF), effects of a whole watershed calcium addition on soil nitrogen and carbon cycling (NSF), carbon and nitrogen cycling in urban watersheds and ecosystems (NSF LTER) and the effects of exotic earthworm invasion on soil nitrogen and carbon cycling (NSF). Groffman was/is a member of the Steering Committee for the Workshop on Advanced Approaches to Quantify Denitrification (NSF funded), the U.S. National Committee for Soil Science, the Hubbard Brook Research Foundation Nitrogen Scientific Working Group, the NOAA Gulf of Mexico Hypoxia Nutrient Reduction Workgroup, the Working Group on Aquatic Terrestrial Biogeochemistry at the National Center for Ecological Analysis and Synthesis (NCEAS), the Working Group on Trace Gas Fluxes at NCEAS, and the Expert Group on N₂O and CO₂ Emissions from Agricultural Soils, IPCC/Organization for Economic Cooperation and Development (OECD) Programme on National Greenhouse Gas Inventories. He was a lead author for the Second (Wetlands) and Third (North America) Assessment Reports of the Intergovernmental Program on Climate Change (IPCC). He currently serves on the editorial boards of Ecology and Ecosystem and was chair of the Soil Ecology section of the Ecological Society of America from 1997 – 98 and the Wetland Soils Section of the Soil Science Society of America from 2002 - 2003.

Dr. Geroge R. Hallberg is a principal with The Cadmus Group, Inc., in Watertown, Massachusetts, providing environmental research, regulatory analysis, and management services. He currently provides technical, scientific, and management support for USEPA drinking water programs. He has been involved in a variety of applied research programs for 30 years, particularly related to water-quality and contaminant occurrence, agriculture and the environment, environmental monitoring/public health surveillance, and hydrogeology. He has published more than 150 technical papers on these subjects. Hallberg has a BA in Geology from Augustana College (1970) and a PhD in Geology from the University of Iowa (1972). Hallberg was designated a lifetime National Associate of the National Academies. For the National Academy of Science-National Research Council's, Water Science and Technology Board, he recently served as the Chair for the 2001 report, Opportunities to Improve the USGS National Water Quality Assessment Program. He also recently served on the NRC's Committee (2004) on Assessment of Water Resources Research for the Nation and the Committee (2006) on Managing Coal Combustion Residues in Mines. He has also served two terms on the NRC's Board on Agriculture and Natural Resources (1996-2001), and on the Long Range Soil and Water Conservation Committee (1990-1994), that produced the report Soil and Water Quality: An Agenda for Agriculture, which received the 1995 Merit Award from the Soil and Water Conservation Society of America. He has served as a consulting member to USEPA's Science Advisory Board and has served on the National Advisory Council For Environmental Policy and Technology, the Management Advisory Group for the Office of Water, serving as Chair for the Nonpoint Source Program Workgroup, and also as a chair for FIFRA Science Advisory Subpanel for the Office of Pesticide Programs. Other national service has included: The H. John Heinz III Center for Science, Economics, and the Environment, Designing a Report Card for the Nation's Ecosystems, Croplands Workgroup (1998-2002), for the White House Office of Science and Technology Policy; The Gulf of Mexico Hypoxia Assessment Editorial Board (1999) for the White House OSTP Committee on Environment and Natural Resources/NOAA; the National Forum on Nonpoint Source Pollution, as Co-leader for the Education Initiatives Workgroup (1993-1995); Associate Editor, Water Resources Bulletin. Prior to joining the Cadmus Group, Hallberg was the Associate Director for the University of Iowa Hygienic Laboratory, the state of Iowa's public health and environmental laboratory. He was with the State of Iowa, Department of Natural Resources, from 1972 through 1993, where he served as chief of Environmental Research and in other positions. He was the program developer for Iowa's Agricultural-Energy-Environmental Initiative that was awarded USEPA's 1992 Administrator's Award for Excellence in Pollution Prevention. He was awarded the 1992 Division of Soil Conservation Award, for outstanding service in soil and water conservation, by the Iowa State Soil Conservation Committee and Iowa Department of Agriculture and Land Stewardship. He also directed other projects such as Iowa's Statewide Rural Well- Water Survey, the Groundwater Vulnerability Mapping Project, and the Nonpoint Source Monitoring Program. He led the development of the Iowa Model Farm's Demonstration Project that received a 1991 Environmental Achievement Award from the National Environmental Awards Council. He was the author of Iowa's Integrated Program for Energy Conservation and Environmental Protection that won the

1990 Program Innovation Award from the National Association of State Energy Officials. Hallberg was an Adjunct Professor at both the University of Iowa and Iowa State University, with appointments in Preventive Medicine and Environmental Health, Environmental Engineering, and Geology, and served on the Executive Committee for the Center For Health Effects of Environmental Contamination.

Mr. Keith G. Harrison, M.A., R.S., R.E.H.S., Certified Senior Ecologist, retired on February 28, 2005 from the state of Michigan after 25 years of service. For the last 12 years of his state career, he held two concurrent positions within state government. From 1992 – 2005, he served as the Executive Director of the Michigan Environmental Science Board. During the same period, he also served from 1992 – 1997 as the Director of the Michigan Department of Management and Budget's Environmental Administration Division and from 1997 – 2005 as the Director of the Michigan Department of Environmental Quality's Office of Special Environmental Projects. Concurrent with the two positions above, he also held a third state position from May to October 2001, as the Acting Director of the Michigan Office of the Great Lakes. Previous state positions held include two years as Environmental Affairs Manager for the Michigan Department of Corrections; five years as Senior Environmental Specialist for the Michigan Toxic Substance Control Commission, and four years as a Public Health Consultant with the Michigan Department of Public Health. Prior to state service, Mr. Harrison was employed as a Senior Ecologist with a Michigan environmental engineering firm; Chief Environmental Planner for a Michigan-Indiana regional planning agency; Environmental Program Coordinator for a Michigan regional planning agency, and Sanitarian with a Michigan county health department. Mr. Harrison obtained his Bachelor of Science degree in 1972 in fisheries and wildlife biology from Michigan State University and a Master of Arts degree in 1974 in biology (ecology) from Western Michigan University. He has been licensed since 1978 as a Registered Sanitarian and Registered Environmental Health Specialist, and, since 1981, has been certified as an Ecologist by the Ecological Society of America (ESA). In 2004, his certification was upgraded to that of Senior Ecologist by the ESA. Mr. Harrison's professional research and work have resulted in over 90 governmental and professional scientific publications addressing a wide variety of environmental, environmental health, natural history, and natural resources management topics. He is a member of the Ecological Society of America, Michigan Environmental Health Association, and Michigan Association of Environmental Professionals. Mr. Harrison's areas of expertise are terrestrial ecology, environmental science, and environmental health science. He has served as a consultant to the U.S. Environmental Protection Agency (USEPA) Science Advisory Board's (SAB) Ecological Processes and Effect Committee and as an invited ecology expert for the USEPA and U.S. General Accounting Office - National Academy of Sciences for their respective environmental indicators initiatives. He currently serves on the SAB's Advisory Council on Clean Air Compliance Analysis' Ecological Effects Subcommittee, which is looking air quality and the effects of nitrogen deposition. In February 2005, Mr. Harrison started the consulting firm, KGH Environmental, PLC, and recently completed (2006) a contract with the state of Michigan to prepare its 2005 biennial report on the state of Michigan's Environment.

Mr. William Herz is the Vice President of Scientific Programs for The Fertilizer Institute (TFI). He holds a BS from Cornell University and a MPH from George Washington University in environmental and occupational health. Mr. Herz, with more than 20 years of professional experience, has a multidisciplinary background in risk management and assessment, toxicology, public health, and environmental science. Mr. Herz has chaired a concurrent session at the 3rd Annual Nitrogen Conference in Nanjing, China, in Oct., 2004 entitled "NO_x, N₂O, and NH₃ Emissions at Global and Regional Scales" and presented a paper within this session entitled "Nitrogen Leakage and the Agricultural Component." Recently he chaired a plenary session on N and P trading at the 2nd Annual Water Quality Trading Conference entitled "Trading with Non-Point Sources." Mr. Herz works with stakeholders on EPA particulate matters regulations as they relate to reactive N as well as on the topics of dust suppression/control from agricultural facilities; and ambient air quality standards for ammonia. On behalf of TFI Mr. Herz has developed a risk management protocol for assessing the safety and environmental characteristics of fertilizer products which included elemental assessments of trace metals and contaminants; risk assessments for consumers and applicators; and a toxicological product testing program. Mr. Herz has a background in helping agencies prioritize risk reduction, having worked in this capacity with both the Office of Water and the Office of Solid Waste and Emergency Response. He has published articles on the topic of risk reduction prioritization amongst government agencies including "A Process to Reconcile Priorities Among Agencies Responsible for Environmental Health Risks" and "A Risk Management Perspective on Fertilizer Safety." Mr. Herz has been involved in the planning and implementation of the International Nitrogen Initiative (INI) to fund meeting and research goals. TFI remains active with this group, and co-funded a further effort with the Scientific Committee on Problems in the Environment (SCOPE) to produce a book entitled "Agriculture and the Nitrogen Cycle: Assessing the Impacts of Fertilizer Use on Food Production and the Environment." Relevant recent experience includes serving the United States Department of Agriculture as an expert reviewer for the National Research Initiative competitive grants program in agricultural air quality, serving as an invited expert to comment on the Canadian government's rule on particulate matter, serving as a reviewer on the Central Region Air Planning Association development of models for ammonia emissions, and working with the state of Iowa to develop workable regulations governing agricultural air quality. He also has developed numerous technical comments on both the feasibility and methodology surrounding agricultural air quality regulations, especially in regard to ammonia. Mr. Herz serves as an officer of the American Chemistry Society agricultural subdivision, where he organizes symposia on topics related to agricultural and environmental quality. William Herz was critical in enlisting industry support and funding for a number of voluntary regulatory initiatives or research efforts that further the goal of product stewardship or product safety. For example, TFI undertook a voluntary initiative under the Environmental Protection Agency's (EPA) high production volume challenge, and spent over \$3 million to generate detailed toxicological and ecotoxicological data on nitrogen based fertilizers, among others. In addition, he supported the USDA NRCS meeting on Agriculture and Air Quality to be held at the

Bolger Center in Potomac, Md. Mr. Herz led the development of the TFI-PPI Product Stewardship brochure, which focuses on the promotion of nutrient management principles and guidelines. Recently he authored a book chapter entitled Fertilizers: Agricultural and Horticultural which appears in the United States Geological Survey 7th Edition of Industrial Minerals and Rocks.

Dr. Donald L. Hey is Senior Vice President and co-founder of The Wetlands Initiative and Director of Wetlands Research, Inc., both in Chicago, Illinois. He founded the Des Plaines River Wetlands Demonstration Project in Lake County, Illinois, and worked to acquire and restore Hennepin & Hopper Lakes (2,600 acres of marsh and prairie) in Putnam County, Illinois. He formerly was president of Hey & Associates, an environmental services consulting firm. He received a B.S. in civil engineering from the University of Missouri at Rolla, an M.S. in water resources engineering from Kansas University, and a Ph.D. in environmental engineering from Northwestern University. His research interests focus on restoration of river and wetland systems and development of low-cost management strategies for sustaining natural aquatic ecosystems. Dr. Hey has served on a number of committees and editorial boards: the National Oceanic and Atmospheric Administration, Committee on Environment and Natural Resources, Gulf of Mexico Hypoxia Assessment Plan; Technical Proposal Evaluation Committee, Everglades National Park, National Park Service; the U.S. Environmental Protection Agency Science Advisory Board; the International Joint Commission, Levels Reference Study; the National Research Council, Committee on the Restoration of Aquatic Ecosystems; the Illinois Department of Conservation, Wetland Advisory Council; Ecological Engineering; and, Restoration Ecology. He is co-author of A Case for Wetland Restoration (Wiley & Sons, 1999) and numerous articles on flood damage reduction and nutrient control. Recent articles related to the latter topic include: Nutrient Farming: The business of environmental management, Ecological Engineering, 24 (2005) and Nutrient Farming and Traditional Removal: an Economic Comparison, Water Environment Research Foundation, 03-WSM-6CO (2005).

Dr. Robert G. Hoelt was raised on an irrigated grain and livestock farm in east central Nebraska. He obtained his BSci and MSci from the University of Nebraska and his PhD in soil science from the University of Wisconsin in 1972. Following graduation he was employed as an Extension Agronomist at South Dakota State University until 1973 when he moved to the University of Illinois as an Assistant Professor of Extension and Research-Soil Fertility. He progressed through the ranks to Professor in 1981. Dr. Hoelt served as Coordinator of Agronomy Extension from 1977 to 2004 and Associate Head of the Department of Crop Sciences from 2004-2005. In 2005, he was named Head of the Department of Crop Sciences. Dr. Hoelt has devoted a major portion of his research career to projects designed to evaluate factors influencing the efficiency of nutrient use. His work with nitrification inhibitors provided classical data that allows scientists and crop producers to make an informed decision on where these products will likely be beneficial. His work on the effect of excess moisture on nitrogen loss now allows producers to apply the proper rate of nitrogen knowing that they can utilize

climatic data for the specific site to predict whether loss potential has been great enough to justify supplemental application after periods of excessive rain. His work on factors affecting immobilization and mineralization of nitrogen has brought a new perspective to the importance of proper nitrogen management for optimum crop production while maintaining environmental quality. Dr. Hoeft has expanded his research program to include work on manure management and on factors affecting the potential for phosphorus loss from agricultural soils. Results of this work have been incorporated into nutrient management plan modules. He has authored 3 books, 7 book chapters, over 40 scientific journal articles and well over 200 professional and popular articles. His research programs have clearly provided a data base for individuals to utilize in designing nitrogen management programs that will optimize production and minimize the potential for nitrogen to have an adverse impact on water quality. Dr. Hoeft was the first Editor of the Journal of Production Agriculture and served as President of the American Society of Agronomy, the largest agricultural scientific society in the U.S. Dr. Hoeft's research has been funded by Illinois EPA, Illinois Department of Agriculture, United States Department of Agriculture, Dow Chemical Company, The Andersons, Central Illinois Power, SKW, Trostberg, Germany, Illinois Pork Producers, Pioneer Hybrids, Northern Illinois Water, Sohio, Brandt Chemical, and The Sulphur Institute. He has been named a Fellow in the American Society of Agronomy and the Soil Science Society of America.

Dr. Richard B. Howarth is Professor of Environmental Studies at Dartmouth College. Dr. Howarth graduated summa cum laude from the Biology and Society Program at Cornell (A.B., 1985) and earned an M.S. in Land Resources at the University of Wisconsin-Madison (1987). He pursued his doctorate at the Energy and Resources Program at the U.C. Berkeley (Ph.D., 1990), where he specialized in the economics of natural resources and sustainable development. Dr. Howarth's research program focuses on issues of energy use, climate change, and ecological conservation, exploring themes that include: (a) the role of discounting, sustainability, and intergenerational fairness in evaluating long-term environmental policies; (b) mathematical models of the relationship between economic growth, the natural environment, and human well-being; (c) the appropriate role of public policies in promoting energy efficiency and the adoption of "clean" energy technologies; and (d) the valuation of ecosystem services and the role of economic, social, and moral values in managing natural systems.

Dr. Robert W. Howarth earned a BA from Amherst College in 1974 and a Ph.D. jointly from MIT and the Woods Hole Oceanographic Institution in 1979. He is currently the David R. Atkinson Professor of Ecology & Environmental Biology at Cornell University, a position he has held since 1993. He is also director of the Agricultural Ecosystems Program at Cornell, is an adjunct senior scientist at the Ecosystems Center of the Marine Biological Laboratory in Woods Hole, MA, and represents the State of New York on the Scientific and Technical Advisory Committee of the Chesapeake Bay Program. He was the Coordinating Lead Author for the Millennium Assessment for the chapter on

societal responses to nutrient pollution, released in early 2006. From 1993 to 2002, he was co-chair of the International SCOPE Nitrogen Project, and from 2003-2006 he directed the North American Nitrogen Center (part of the International Nitrogen Initiative). He is the President-elect of the Estuarine Research Federation and will serve as President from 2007 to 2009. He is also a member of the American Institute of Biological Sciences, the American Society of Limnology & Oceanography, and the Ecological Society of America (where he is a part of the Biogeochemical Cycling Rapid Response Team. In recent years, Dr. Howarth's research has been supported by the EPA Star program, NSF Biocomplexity Program, NOAA's Coastal Ocean Program, USDA/CSREES, Woods Hole SeaGrant, the Mellon Foundation, and the Hudson River Foundation. Dr. Howarth's research interests focus on biogeochemistry and ecosystem science, particularly in coastal marine ecosystems and in large river basins. Detailed interests include the interactions of element cycles; global and regional nitrogen and phosphorus cycles; the biotic, physical, and geochemical controls on nitrogen fixation in both aquatic and terrestrial ecosystems; the influence of land-use, management practices, and climate change on export of nutrients from land to waters; atmospheric deposition of nitrogen onto the landscape; the controls and consequences of eutrophication in estuaries; sediment biogeochemistry, particularly in seagrass ecosystems; environmental management and the effects of pollutants on aquatic ecosystems; the interactions between ecosystem processes and community structure; and the application of science to sustaining the biosphere.

Dr. Jeremy Jones is an Associate Professor of Biology with appointments in the Department of Biology and Wildlife and the Institute of Arctic Biology at the University of Alaska Fairbanks. Dr. Jones received his Ph.D. from the Department of Zoology, Arizona State University (1994), M.S. from the Department of Biology, Virginia Commonwealth University (1990), and his B.S. from the Department of Biology, San Francisco State University (1988). Prior to his current appointment, Dr. Jones was an Assistant Professor in the Department of Biological Sciences, University of Nevada, Las Vegas (1996 - 2000), and was a Global Change Postdoctoral Fellow in the Environmental Sciences Division at Oak Ridge National Laboratory (1994 - 1996). Dr. Jones' research interests include the biogeochemistry of nutrients and organic matter in aquatic ecosystems, the watershed scale fluxes of nitrogen and carbon, and the impacts of environmental change on nutrient cycling in watersheds and aquatic ecosystems. His research has focused on ecosystems of the arid southwestern United States, the temperate southeastern United States, and the Arctic and sub-Arctic of Alaska. Dr. Jones has served on several committees for the North American Benthological Society, review panels for the National Science Foundation, and co-edited a book focusing on stream and ground water interactions. He is a member of the North American Benthological Society, the American Society for Limnology and Oceanography, and the Ecological Society of America. Dr. Jones' research has been supported by grants from the National Science Foundation, the Andrew W. Mellon Foundation, the Department of Energy, National Park Service, and the Forest Service.

Dr. Dennis R. Keeney is Emeritus Professor, Department of Agronomy; Emeritus Professor, Department of Agricultural and Biosystems Engineering; Retired, founding Director of Leopold Center for Sustainable Agriculture, and of the Iowa State Water Resources Research Institute, Senior Fellow, Institute for Agriculture and Trade Policy, Minneapolis, MN; Senior Fellow, Council for Agricultural Science and Technology, Ames, IA; and Senior Fellow, Dept of Soil, Water, and Climate, Univ. of Minnesota, St. Paul. He was on the faculties of the Departments of Soil Science and Water Chemistry, 1966-1988. He was awarded a B.S. from Iowa State University in Agronomy, an M.S. from University of Wisconsin-Madison in Soil Science, and a Ph.D. from Iowa State University in Agronomy-Soil Fertility. His interests with respect to nitrogen are at the intersection of land use, particularly agriculture, and water quality. He has published extensively on sources and control of non point source nitrogen and on land use and policies to lower nitrogen loads to waters. He is past president and member of the Soil Science Society of America and the American Society of Agronomy. He is a member of Soil and Water Conservation Society, and the Iowa Academy of Science and a fellow of the American Association for the Advancement of Science. He is past president of the Iowa Environmental Council and former chair of its Water Quality Committee. He is a member of the Research Committee of the Walnut Creek National Wildlife Refuge Prairie Learning Center, the Iowa Risk Assessment Task Force, the Spira/GRACE Advisory Board, the Water for Iowans Board of Directors, the Food and Water Watch Advisory Board, the Blue Lands Green Waters science team, the Advisory Board of the Iowa State Water Resources Center, and the Thomas Jefferson Agriculture Institute.

Dr. Richard Kohn is Professor of Animal and Avian Sciences at the University of Maryland, College Park. He conducts research (75%) and engage in extension education (25%) focused on mathematical modeling to improve animal feeding and management (dairy and poultry) and reduce nutrient losses to the environment. He received his B.S. degree in 1985, M.S. degree in 1987 and Ph.D. in 1998. All degrees were in Animal Science. His research related to the Integrated Nitrogen Research Committee includes development of mathematical models of nitrogen flows on dairy farms, and development and application of software to track nutrient flows on farms. He was recently a member of the National Academies of Sciences Committee on Air Emissions from Animal Feeding Operations and coauthored two reports from that committee. He is currently a member of the Environment Committee of the Federation of Animal Science Societies (FASS). The Environment Committee has six members representing the 5000 members of FASS. He is a member of the American Society of Animal Science, and the American Dairy Science Association.

Dr. Scott F. Korom is Associate Professor in the Department of Geology & Geological Engineering at the University of North Dakota, Grand Forks, ND. He received a B.S. (cum laude) and M.S. in Civil Engineering from the University of Akron, and a Ph.D. in Civil and Environmental Engineering from Utah State University, Logan, Utah. His dissertation was entitled, Denitrification in the Unconsolidated Deposits of the Heber Valley Aquifer. His professional interests include: aquifer denitrification, groundwater

remediation, groundwater and groundwater quality modeling. He is a member of the American Geophysical Union, the American Society of Civil Engineers, the National Ground Water Association, the Tau Beta Pi National Engineering Honor Society and is a Registered Professional Engineer in North Dakota. Dr. Korom has served on review panels for the National Science Foundation, including the National Science Foundation / Environmental Protection Agency Partnership for Environmental Research. He has served as a peer referee for the Australian Research Council, Illinois State Water Survey, Natural Science and Engineering Research Council of Canada, North Dakota State Water Commission, Water Resources Research Institute of the University of North Carolina, and several professional journals.

Dr. JoAnn Slama Lighty has been on the faculty at the University of Utah since 1988. Presently, she is Director of the Institute for Combustion and Energy Studies (ICES) and Professor of Chemical Engineering. She stepped down as Associate Dean for Academic Affairs in the College of Engineering in July 2004 having been in the Dean's Office for 9 years. She received a B.S. and Ph.D. in Chemical Engineering from the University of Utah. Her dissertation was on the fundamentals of thermal treatment for the cleanup of contaminated solid wastes. Dr. Lighty's research interests are in the areas of air toxics, Soot formation and oxidation, combustion-generated aerosols and their characterization; NO_x formation, and biomass combustion. She is currently involved in the Southwest Consortium for Environmental Research and Policy, the Center for the Simulation of Accidental Fires and Explosions (C-SAFE), and recently received a National Science Foundation, Nanoscale Interdisciplinary Research Team (NIRT) award focused on the formation of soot from diesel engines. She received the SWE Distinguished Engineering Educator in 2004, Utah Engineering Educator of the Year Award in 2001 and has been on several national and university committees, including: U.S. EPA's National Advisory Council for Environmental Policy and Technology, Environmental Technologies Subcommittee (2004-present), Clean Air Scientific Advisory Committee (CASAC), Technical Subcommittee for Particle Monitoring (1998-2003), and Science Advisory Board (SAB), Environmental Engineering Committee (1992-1999); Brown University's Superfund Basic Research Program, External Advisory Committee (July 2006-present); Engineering Advisory Council, Brown University (Feb 2004-present); Board of Trustees, Academy of Math, Engineering, and Science, appointed by Former Governor Leavitt (Oct 2002-July 2005).

Dr. Gary M. Lovett is Senior Scientist at the Institute of Ecosystem Studies. He received a B.S. Biology from Union College and a Ph.D. Dartmouth College, Biology/Plant Ecology. He is also Adjunct Professor of Biology at the University at Albany (SUNY-Albany) and the Graduate Faculty in Ecology, Rutgers University. His recent professional activities include chairing the Steering Committees of the Northeastern Ecosystem Research Cooperative and the Tenth Cary Conference, "Ecosystem Function in Heterogeneous Landscapes"; co-organizing the Nature Conservancy Workshop on Air Pollution and Biodiversity, May 2004; chairing the Gordon Conference on Forested Catchments, 1999-2001. "Theme: Science and Policy

in Watershed Research”; serving as a Panel member for the U.S. Geological Survey Cooperative Research Program Evaluation, 1999.; being an Expert Witness before the U.S. House of Representatives Subcommittee on Water Resources and Environment, 1999; serving as a member of the White House Office of Science and Technology Policy (OSTP), Integrating the Nation's Environmental Monitoring and Research Programs: Nutrient Enrichment Team, 1998; serving on the Advisory Panel for the US EPA, Mountain Acid Deposition Program, 1996-1998 and on the Peer Review Panel for the US EPA Clean Air Status and Trends Network, 1997

Dr. Greg McIsaac is currently an Associate Professor in Natural Resources and Environmental Sciences at the University of Illinois at Urbana Champaign. He holds a Ph.D. in Agricultural Engineering from the University of Illinois, a M.S. in Agricultural Engineering from University of Minnesota, and a B.S. in Chemical Engineering from University of New Hampshire. His research focuses on the effects of agricultural land management practices on hydrology, nutrient and sediment transport and water quality. Dr. McIsaac teaches courses in watershed hydrology and ecosystem management and has have served as an Associate Editor for the Journal of Environmental Quality. In addition, Dr. McIsaac reviews manuscripts for Journal of American Water Resources Association, Transactions of the American Society of Agricultural Engineers, Ecosystems and a variety of other journals. He is a member of the Ecological Society of America, The American Society of Agronomy, The American Society of Agricultural and Biological Engineers and the American Water Resources Association.

Dr. William J. Mitsch is Distinguished Professor in the School of Environment and Natural Resources at The Ohio State University, and Director of the Wilma H. Schiermeier Olentangy River Wetland Research Park. Dr. Mitsch's research interests include wetland ecology and biogeochemistry, the creation and restoration of wetlands, ecosystem modelling and wetland management policy. He is extensively published in the peer reviewed literature and wrote the textbook Wetlands, now in its 3rd edition (2000). He is Editor-in-Chief of the journal Ecological Engineering and was founder and first president of the American Ecological Engineering Society (AEES). Dr. Mitsch received his Ph.D. in Environmental Engineering Sciences (Systems Ecology) from the University of Florida in 1975. Prior to his position at Ohio State, he taught at Illinois Institute of Technology and University of Louisville. In August 2004, Dr. Mitsch received the 2004 Stockholm Water Prize in Stockholm Sweden from Swedish King Carl XVI Gustaf for a career in ecological engineering, ecological modelling, and wetland science and management.

Dr. William Moomaw is Professor of International Environmental Policy and Director of the Center for International Environment and Resource Policy at Tufts University's Fletcher School of Law and Diplomacy. He received a BA from Williams College and a PhD in physical chemistry from Massachusetts Institute of Technology. His research interests include quantitative indicators of environment and development; sustainable development; trade and environment; technology and policy implications for climate

change; water and climate change; economics and geochemistry of the nitrogen cycle; biodiversity; negotiation strategies for environmental agreements. His professional activities include serving on the Intergovernmental Panel on Climate Change (IPCC). In this activity has served as Lead Author, 1995 "Industry" and "Industry, Energy and Transportation: Impacts and Adaptation; Convening Lead Author, IPCC 2001" Technological and Economic Potential for Emissions Reductions"; Lead Author IPCC 2005 "Introduction", Carbon Dioxide Capture and Storage Special Report; and Lead Author IPCC 2007 "Energy Supply." He serves on the Board of Directors for the Consensus Building Institute; Earthwatch Institute, and Clean Air Cool Planet.

Dr. Arvin Mosier is working as a consultant and is also a Visiting Professor in the Agricultural and Biological Engineering Department at the University of Florida. He received a B.S and MS in Chemistry and a Ph.D. in Soil Science from Colorado State University. From 1967 to 2004, he served as a Research Chemist for the U.S. Department of Agriculture (ARS) in Fort Collins, CO. His consulting work focuses on linking the carbon and nitrogen cycles to mitigate agricultural greenhouse gases. His interests at the University of Florida involve food security, primarily in the developing world. The goal is to provide information to decision makers, in the agricultural industry or government to make rational decisions concerning global environmental change and agriculture. Dr. Mosier chaired the Scientific Committee On Problems in the Environment a part of the International Scientific Union activity on nitrogen fertilizer, published by Island Press as Volume 65, published in 2004. He was on the International Global Atmospheric Chemistry steering committee from 1999-2002 and was convener of IGAC's activity on biosphere, atmosphere, trace gas exchange in 1998. He was managing editor of Nutrient Cycling in Agroecosystems from 1991 until 2004 and remains on the Journal's editorial committee. He currently serves as an external advisor for the NitroEurope Integrated Project on Greenhouse Gases (this is a 5 year integrated nitrogen project that involves approximately 65 research locations across the European Union). He is also serving as an advisor and research collaborator for a project with the Faculty of Land and Food Resources, University of Melbourne, Melbourne, Australia entitled "Improving the efficiency, profitability and environmental friendliness of nitrogen fertilizers".

Dr. Hans W. Paerl is Kenan Professor of Marine and Environmental Sciences, at the UNC-Chapel Hill Institute of Marine Sciences, Morehead City, NC. His research includes; microbial ecology, nutrient cycling and primary production dynamics of aquatic ecosystems, environmental controls of algal blooms, and assessing the causes and consequences of man-made and climatic (storms, floods) nutrient enrichment and hydrologic alterations of inland, estuarine and coastal waters. His recent studies have identified the importance and ecological impacts of atmospheric nitrogen deposition in estuarine and coastal environments. Dr. Paerl was recently (Feb. 2003) awarded the G. Evelyn Hutchinson Award by the American Society of Limnology and Oceanography for his work in these fields and their application to interdisciplinary research, teaching and management of aquatic ecosystems. His work plays a central role in coastal water

quality and fisheries issues facing North Carolina and the nation. Dr. Paerl's research is supported by the National Science Foundation, the North Carolina Sea Grant program, the NOAA-ECOHAB Program, the North Carolina Dept. of Environment and Natural Resources (NCDENR) and St. Johns Water Management District of Palatka, FL.

Dr. Gyles. W. Randall directs the soils research program at the Southern Research and Outreach Center of the University of Minnesota. He was awarded a B.S. and M.S. in Soil Science from the University of Minnesota and earned his Ph.D. at the University of Wisconsin. His research interests include the management of nitrogen for agricultural crops to protect groundwater quality. He is a member of the American Society of Agronomy (ASA), Soil Science Society of America (SSSA), International Soil Science Society (ISSS), Soil and Water Conservation Society (SWCS), Council on Agricultural Science and Technology (CAST).

Mr. Jack D. Riessen serves as Executive Officer to the Director of the Iowa Department of Natural Resources. He served for over two decades in Iowa's Water Quality Bureau, most recently as chief. He holds a B.S. in Agricultural Engineering from Iowa State University. Mr. Riessen's career has focused on the protection of Iowa's waters including source and non-point source pollution, the NPDES permitting program, stormwaters, and the protection of flood plains. Currently he is involved with the developing standards on nutrients for the protection of surface waters. He has served on a variety of advisory bodies and is currently a member of the Iowa Water Center Advisory Council.

Dr. Wayne Robarge is Professor – Soil Physical Chemistry in the College of Agriculture and Life Sciences at North Carolina State University. He holds a Ph.D. in Soil Science with emphasis on Soil Chemistry and minors in Chemistry and Water Chemistry. His areas of expertise include: soil physical chemistry/analytical chemistry/environmental chemistry; fate and transport of inorganic/organic solutes in the environment (impacts of acidic deposition on forest ecosystems; trace metal chemistry in soil ecosystems; trace metal content of agronomic fertilizers; chemical analysis, sources, fate of perchlorate in the environment); impact of pollutants (ammonia, nitric oxides, nitrous oxides, xenobiotics) from agricultural systems (crop and animal) on air quality; and the deposition of atmospheric pollutants to agricultural and natural ecosystems. His current research focuses on fate and transport of ammonia emissions from CAFOs through use of annular denuder technology, passive samplers, relaxed eddy accumulation and atmospheric equilibrium models. He is also part of the National Air Emissions Monitoring Study that is required by the Air Consent Agreement between the EPA and the animal industry in the United States. Past research activities include the US EPA Mountain Cloud Chemistry program; USFS Forest Response Program; Rockefeller Foundation funded project on gas emissions following land-clearing in Amazon basin; US EPA funded study on biogenic emissions of nitric oxides from row crop agriculture; and a variety of projects funded by multiple funding sources related to ammonia

emissions from CAFOs. He has served on the following advisory committees: Panel Manager, 2003, USDA National Research Initiative (NRI) – Air Quality (first panel in this new NRI funding area); Member Ad-Hoc Committee on Air Emissions from Animal Feeding Operations, National Research Council/National Academy of Sciences (2001-2003); Member USDA Agricultural Air Quality Task Force (2000-2002); Member Committee on Worker and Public Safety, National Pork Board (2002-present); Chair (Fertilizers/Soils sub-division within Agrochemicals Division) American Chemical Society (2004-2006); Program Organizer (Fertilizers/Soils sub-division within Agrochemicals Division) American Chemical Society (2001-2003); Board Representative, Div. S-2 (Soil Chemistry, Soil Science Society of America (1998-2001); Chair, Div. S-2 (Soil Chemistry), Soil Science Society of America. Sources of current and recent grant support: U.S.D.A. National Research Initiative, U.S. EPA, National Pork Board, North Carolina Pork Council, Division of Air Quality, North Carolina Department of Environmental and Natural Resources, US Forest Service, Animal and Poultry Waste Management Center, NCSU (evaluation of alternative technologies for swine waste for reduction in ammonia emissions – funded under agreement between NC Attorney General's office and Smithfield Foods and Premium Foods), and Defense Coastal/Estuarine Research Program (DCERP) at Marine Corp Base Camp Lejeune, NC, Department of Defense (Research Triangle Institute, RTP, NC – project manager).

Dr. Donald Scavia is Professor and Research Associate Dean of the University of Michigan's School of Natural Resources and Environment, Director of the Michigan Sea Grant program, and interim Director of the Cooperative Institute for Limnology and Ecosystem Research. His current research, teaching, and service focus on integrating natural and social sciences in environmental policy contexts through integrated assessment, ecological modeling, and other decision support tools. His primary research, supported by the National Science Foundation, the National Oceanic and Atmospheric Administration, the Department of the Interior, and the State of Michigan, focuses on modeling and assessing impacts of changes in human-dominated watersheds on freshwater and marine ecosystems, and he has published on the effects of altered nitrogen cycles on coastal and estuarine ecosystems. He has also published extensively on lower food web dynamics, aquatic biogeochemical cycling, and ecosystem modeling.

Dr. Scavia serves on the Science Committee for the NSF Collaborative Large-scale Engineering Analysis Network for Environmental Research (CLEANER) program, on the Board of Advisors for the North American Nitrogen Center, and on the Environment Domain committee of the Key National Indicators Initiative. At UM, he serves on the Executive Committee for the Erb Institute for Global Sustainable Enterprise and the Graham Environmental Sustainability Institute. He also served on the Board of Directors for the International Association for Great Lakes Research (IAGLR) and for the American Society for Limnology and Oceanography (ASLO), on the BOSC subcommittee reviewing EPA's STAR and GRO Fellowship programs, and as Associate Editor for Estuaries and Coasts (ERF) and Frontiers in Ecology and Environment (ESA). Prior to joining the faculty at the University of Michigan, he was a research scientist and research manager at NOAA, including serving as Chief Scientist for NOAA's National

Ocean Service. Dr. Scavia received his BS, MS, and PhD degrees in Environmental Engineering from Rensselaer Polytechnic Institute and the University of Michigan, and is certified as a Senior Ecologist through the Ecological Society of America.

Dr. Peter Scharf is an associate professor in the Plant Sciences Division at the University of Missouri, where he chairs the Soil Fertility Working Group. He holds a B.S. from the University of Wisconsin (Biochemistry, Genetics), an M.S. from Virginia Tech (Agronomy), and a Ph.D. from Virginia Tech (Crop and Soil Environmental Sciences). His research focuses on economic and environmental impacts of nitrogen fertilizer management. He is active in the development of innovative technologies for diagnosing the correct rate of fertilizer, including aerial and ground-based sensors. Much of this work is done with the cooperation of farmers and agribusiness people. Dr. Scharf is an 11-year member of the North Central Regional committee on Predicting Nitrogen Mineralization to Meet Crop Needs and Protect Water Resources (NC218), was a member of the American Society of Agronomy's ad hoc committee to consider publication of a society monograph on Nitrogen and Hypoxia in the Gulf of Mexico, is in his second term as Associate Editor for the Soil Science Society of America Journal, and is current chair of the Missouri Certified Crop Advisory Board. Dr. Scharf's work is supported by EPA, Missouri Fertilizer & Ag Lime Council, USDA-Natural Resources Conservation Service, Missouri Dept. of Agriculture, and the Missouri Dept. of Natural Resources.

Dr. James Jay Schauer, Ph.D., PE is Associate Professor in the Department of Civil and Environmental Engineering, Director of the Water Science and Engineering Laboratory, Program Director of the Wisconsin State Lab of Hygiene, and Chair of the Air Resource Management Program at the University of Wisconsin-Madison. The Colorado School of Mines granted him a B.S. in Chemical and Petroleum Refining Engineering, the University of California at Berkeley an M.S. in Environmental Engineering, and the California Institute of Technology a Ph.D. in Environmental Engineering Science. He is a Registered Professional Engineer in Colorado and Illinois. Dr. Schauer's research interests relate to the development of a quantitative understanding of the origin of air pollutants and the impact of these pollutants on human health and the ecosystem, such that effective control strategies can be developed and designed to mitigate the adverse effects of air pollution. His research group is developing advanced characterization tools that can be used to determine detailed chemical, physical, and biological characteristics of emissions from air pollution sources and atmospheric pollutants. Such tools provide the basis for air pollution models that can be used to assess the contributions of air pollution sources to atmospheric concentrations of these pollutants, and provide the basis for the development of pollution abatements strategies. Dr. Schauer is a recipient of the Health Effects Institute (HEI) Rosenblith Young Investigator Award and the Haagen-Smit Award presented by Atmospheric Environment Journal in recognition of his contributions to the field of atmospheric sciences. He is an Associate Editor, of the Journal of Environmental Engineering and Science, NRC Canada and serves on the Editorial Advisory Board of

Aerosol Science and Technology (AS&T). He is a member of the American Chemical Society (ACS), the American Association for Aerosol Research (AAAR), and the Air and Waste Management Association (A&WMA). He is a Science and Academic Advisor to the US AID Funded Middle East Regional Cooperation Project, which is a collaborative air pollution research project that brings together Al Quds University (Palestine), the Jordanian Society for Sustainable Development (Jordan), and the Arava Institute for Environmental Studies (Israel).

Dr. Guy Sewell is Professor of Environmental Health Sciences and Robert S. Kerr Endowed Chair at East Central University, Ada, Oklahoma. B.S. Microbiology, minor in Chemistry, May 1980, Oklahoma State University. Oklahoma State University granted him a Ph.D. in Microbiology, with emphasis Biochemistry/Bacterial Physiology. His dissertation was entitled: Interactions of Polyacrylamides used for Enhanced Oil Recovery and Reservoir Isolates of the Sulfate-Reducing Bacterium *Desulfovibrio*. Dr. Sewell is an internationally recognized expert in the areas of subsurface fate and transport, water quality and the biotreatment of waste. Dr Sewell has published over 50 papers on topics such as ecology, environmental cleanup and bioprocesses, and has made scientific presentations at numerous national and international meetings. Prior to coming to ECU, Dr. Sewell worked in the environmental services industry and as a research microbiologist with the U.S. EPA at the Robert S. Kerr Environmental Laboratory in Ada, Oklahoma. While at EPA his duties included conducting research on microbial processes in the subsurface, subsurface ecology, and the development of innovative technologies for the treatment of hazardous waste. He also served as Acting Branch Chief and as Research Team Leader for the Biotransformation, Subsurface Ecology, Ecosystems Restoration and Lake Texoma Research Groups.

Dr. Bryan W. Shaw is an Associate Professor and member of the Center for Agricultural Air Quality Engineering and Science in the Biological & Agricultural Engineering Department, Texas A&M University. He received his Bachelor of Science and Master of Science degrees in Agricultural Engineering from Texas A&M University and his Ph.D. in Agricultural Engineering from the University of Illinois at Urbana-Champaign. Dr. Shaw teaches and conducts air quality research on topics including development of accurate emission factors for feed and grain handling, emissions from cattle feed yards, development of air pollution dispersion models, and fugitive dust emissions from field operations. Dr. Shaw recently spent one year working with USDA-NRCS as Special Assistant to the Chief under an Interagency Personnel Agreement. In this role he provided national leadership in the development of policies and programs to address agricultural air quality concerns.

Mr. Paul E. Stacey is Supervising Environmental Analyst with the Connecticut Department of Environmental Protection's Bureau of Water Management (since 1985). He oversees agency participation in the Long Island Sound Study (LISS) and Long Island Sound (LIS) management programs and the state's nonpoint Source Program.

Previously he spent eight years at the Academy of Natural Sciences Applied Ecology Program. Mr. Stacey received a B.A. in Psychology from the College of the Holy Cross, Worcester, MA (1972), a B.S. in Wildlife and Fisheries from Utah State University (1974), and an M.S. in Fisheries Biology from Colorado State University (1977). As a principal state water quality analyst and manager focusing on cultural eutrophication, Mr. Stacey is well versed in the study of reactive nitrogen sources; air, watershed and coastal nitrogen dynamics; environmental effects; and management. He has emphasized a multimedia approach in these endeavors, linking airshed and watershed sources into comprehensive analyses and management efforts. Having served on a number of EPA, NOAA and ASIWPCA workgroups to define and establish policy and criteria for nitrogen, most recently as an invited participant in an EPA effort to define critical loads of nitrogen and acidifying compounds, Mr. Stacey is expert in programs and policies related to nitrogen control in an integrated protocol. Connecticut has implemented the most extensive nitrogen-trading program in the country, essential to the success of a bi-state management plan (TMDL) for nitrogen, efforts in which Mr. Stacey has played prominent roles. He is responsible for formulating Connecticut's risk-based dissolved oxygen criteria, necessary to effective management of nitrogen enrichment in LIS. Further, his long-standing positions on the Scientific and Technical Advisory Committee for the LISS and as a technical reviewer for state and federal research funding programs have involved him in research programs that have improved nitrogen understanding and control. He is a member of the Estuarine Research Federation and its Program Advisory Council for ERF 2007; the Water Environment Federation; and the New England Estuarine Research Society. Mr. Stacey has been honored with distinguished service awards from CTDEP and the Governor, and was a lecturer in the Curtis and Edith Munson Distinguished Lecturer Series at Yale University. He sits on the New England Governors and Eastern Canadian Premiers Acid Rain Steering Committee and the Interstate Environmental Commission. He regularly presents at professional conferences on nitrogen management and the LIS ecosystem and has produced technical publications on trading, monitoring and atmospheric deposition of nitrogen including co-editorship of a Coastal and Estuarine Studies volume for the AGU. In the last five years Mr. Stacey has served on over a dozen advisory committees including projects for the Water Environment Research Foundation, the Hubbard Brook Research Foundation, and the Institute of Marine Sciences in Lisbon on projects related to nitrogen dynamics and management, setting feasible management goals and defining effective management tools. Mr. Stacey is responsible for extensive monitoring programs for the LISS and the National Coastal Assessment. He has been awarded special funding for projects to develop a nutrient watershed model in Connecticut (completed), to establish nitrogen criteria for the protection of eelgrass beds (current), and to assess Connecticut's nitrogen trading program and evaluate its potential for expansion (completed).

Dr. Thomas L. Theis is the Director of the Institute for Environmental Science and Policy, a cross-disciplinary unit dedicated to promoting collaborative research on the environment, and Professor of Civil and Materials Engineering at the University of Illinois at Chicago. He earned his B.S.C.E, M.S.C.E. and Ph.D at the University of

Notre Dame. His areas of expertise include the mathematical modeling and systems analysis of environmental processes, the environmental chemistry of trace organic and inorganic substances, nutrient flows and impacts associated with agricultural systems, interfacial reactions, subsurface contaminant transport, hazardous waste management, industrial pollution prevention, and industrial ecology. He has been principal or co-principal investigator on over fifty funded research projects totaling in excess of ten million dollars, and has authored or co-authored over one hundred papers in peer reviewed research journals, books, and reports. He is a member of the USEPA Science Advisory Board, and is a former editor of the Journal of Environmental Engineering. From 1980-1985 he was the co-director of the Industrial Waste Elimination Research Center (a collaboration of Illinois Institute of Technology and University of Notre Dame), one of the first Centers of Excellence established by the USEPA. In 1989 he was an invited participant on the United Nations Scientific Committee on Problems in the Environment (SCOPE) Workshop on Groundwater Contamination, and in 1998 he was invited to by the World Bank to assist in the development of the first environmental engineering program in Argentina. He is the founding Principal Investigator of the Environmental Manufacturing Management Program, one of the Integrative Graduate Education Research and Training (IGERT) grants of the National Science Foundation.

Dr. Valerie Thomas is the Anderson Interface Associate Professor in the School of Industrial and Systems Engineering at the Georgia Institute of Technology, with a joint appointment in the School of Public Policy. Dr. Thomas received a Ph.D. in theoretical physics from Cornell University, and a B. A. in physics from Swarthmore College. She was a post-doctoral Research Fellow at the Department of Engineering and Public Policy at Carnegie Mellon University. From 1988-2004 she was a Research Scientist at Princeton University at the Princeton Environmental Institute and the Center for Energy and Environmental Studies. In 2004-05 she was the American Physical Society Congressional Science Fellow. Her expertise is in quantitative approaches to environmental assessment, and the lifecycle environmental impacts of products and materials, including metals and electronics. Current research is in the area of industrial ecology, including energy efficiency, the use of electronics and information technology for lifecycle management of products, and the environmental impacts of global second-hand markets. She is a Fellow of the American Physical Society, and a member of the International Society for Industrial Ecology. She is chair of the 2006 Gordon Research Conference on Industrial Ecology. She has had recent funding from the US EPA STAR grants program and the National Science Foundation.

Dr. Stuart B. Weiss is currently an independent consulting scientist bringing scientific skills and transdisciplinary perspectives to environmental problem solving. He received both his Ph.D. (1996) and B.S. (1984) in Ecology and Evolutionary Biology at Stanford University. He has collaborated with industry, regulators, elected officials, conservation groups, scientists, journalists, landowners, and ranchers (among others) to understand, communicate, and address impacts of N-deposition on threatened and endangered species. His areas of expertise and active research include: 1) Impacts of atmospheric N-deposition on biodiversity, ranging in scale from roadsides to the entire state of

California; 2) Mitigation of N-deposition impacts from power plants, highways, and urbanization, primarily by land acquisitions, research, and adaptive management; precedent-setting projects that have precipitated the new Santa Clara County Habitat Conservation Plan/Natural Communities Conservation Plan; 3) Basic research into the N-cascade with scientific collaborators; 4) Conservation ecology, including population biology, reserve design, invasive species control, sampling and experimental design, modeling, hands-on management/restoration, and regulatory issues; 5) Environmental biophysics and microclimatology, including studies of monarch and checkerspot butterflies, old-growth forests, and some of California's finest vineyards. Dr. Weiss has actively participated in the growing network of N-deposition scientists since 1993. He recently authored a report "Impacts of Nitrogen Deposition on California Ecosystems and Biodiversity" funded by the California Energy Commission (http://www.energy.ca.gov/pier/final_project_reports/CEC-500-2005-165.html). His conference participation and professional service include convening an ongoing nitrogen session at the American Geophysical Union Fall Meeting, invited attendance at National Center for Atmospheric Research workshop on a North American N-Science Plan, Air Pollution Workshops, N-eutrophication Symposium, the National Atmospheric Deposition Program Atmospheric Ammonia Workshop, and presentations at the 2nd and 3rd International Nitrogen Conferences, Ecological Society of America, Society for Conservation Biology, as well as numerous academic seminars and public presentations. His recent grant and contract support include the California Energy Commission, National Fish and Wildlife Foundation, US Fish and Wildlife Service, National Park Service, Calpine Corporation, Waste Management, Inc., World Wildlife Fund, Land Trust of Santa Clara County, The Nature Conservancy, Santa Clara County Open Space Authority, San Mateo County Parks and Recreation Foundation, UC Santa Barbara, Los Alamos National Laboratory, and private donors.

Dr. Mark Williams is a Research Fellow at the Institute of Arctic and Alpine Research and Professor of Geography, at the University of Colorado. He received his Ph.D in Biological Sciences from the University of California at Santa Barbara in 1991. His research interests are the processes that determine the hydrochemistry and biogeochemistry of high-elevation basins, including the storage and release of solutes from the snowpack, biogeochemical modifications of snowpack runoff, nutrient cycling, and hydrologic pathways and residence time. He has conducted research on ecosystem responses to atmospheric deposition of nitrogen and other variables over the last 20 years. He is considered a leading authority on the dynamics of nitrogen cycling in seasonally snow covered ecosystems. Currently he is the PI on the Niwot Ridge Long-Term Ecological Research (LTER) program, the only high-elevation site in the LTER network. The Niwot Ridge LTER program focuses on ecosystem responses to increases in atmospheric deposition of inorganic nitrogen in wetfall and dryfall. He has served on numerous national committees, including chairing the Cryosphere Focus group for the American Geophysical Union. He was a Co-I on the initial grant to start the Consortium of Universities for the Advancement of Hydrologic Sciences (CUAHSI) and currently serves on the Hydrologic Instrumentation Facilities standing committee for CUAHSI. Mark is on the executive committee of the Rocky Mountain Cooperative

Ecosystem Study Unit and on the science advisory board for the National Park Service Inventory and Management project for the Rocky Mountain region, among many other service activities

The individuals who provided comments on the “short list” candidates are:

1. Harold F. Reetz, Jr., Foundation for Agronomic Research
2. Paul Fixen, Potash & Phosphate Institute
3. Walter Schoepf, U.S. Environmental Protection Agency
4. Robert Howarth, Cornell University
5. Guy W. Sewell, East Central University
6. Tyrrell Conway, Advanced Center for Genome Technology
7. Scott F. Korom, University of North Dakota
8. William F. Schillinger, Washington State University
9. James H. Southerland, North Carolina Department of Environment and Natural Resources
10. Daland R. Juberg, Dow AgroSciences LLC
11. Lee Dunbar, Connecticut Department of Environmental Protection
12. Adel Hanna, University of North Carolina at Chapel Hill
13. Robin Landeck Miller, HydroQual, Inc.
14. Dev Niyogi, Purdue University
15. John P St John, HydroQual, Inc
16. James Fitzpatrick, HydroQual, Inc.
17. John Havlin, North Carolina State University