

***GENE E. LIKENS***

PRESIDENT EMERITUS AND DISTINGUISHED SENIOR SCIENTIST  
CARY INSTITUTE OF ECOSYSTEM STUDIES

ANNUAL SCIENTIFIC REPORT  
1 JULY 2009 – 30 JUNE 2010

**PUBLICATIONS**

***Books – Published***

1. Winter, T. C. and G. E. Likens (eds.). 2009. Mirror Lake: Interactions among Air, Land and Water. University of California Press. 361 pp.
2. Likens, G. E. (Editor). 2010. Biogeochemistry of Inland Waters. Elsevier, Academic Press. 728 pp.
3. Likens, G. E. (Editor). 2010. Lake Ecosystem Ecology. Elsevier, Academic Press. 463 pp.
4. Likens, G. E. (Editor). 2010. Plankton of Inland Waters. Elsevier, Academic Press. 398 pp.
5. Likens, G. E. (Editor). 2010. River Ecosystem Ecology. Elsevier, Academic Press. 411 pp.
6. Lindenmayer, D. B. and G. E. Likens. 2010. Effective Ecological Monitoring. CSIRO Publishing and Earthscan. 170 pp.

***Books – In Press***

Weathers, K. C., D. L. Strayer, and G. E. Likens (eds.). 2010. Fundamentals of Ecosystem Science. Elsevier, Academic Press (*In Press*)

***Papers – Published***

Bade, D. L., K. Bouchard and G. E. Likens. 2009. Algal co-limitation by N and P persists after 30 years in Mirror Lake (New Hampshire, USA). *Verh. Internat. Verein. Limnol.* 30 (7):1121-1123.

Buso, D. C., G. E. Likens, J. W. LaBaugh and D. Bade. 2009. Nutrient dynamics. pp. 69-203. In: T. C. Winter and G. E. Likens (eds.). Mirror Lake: Interactions among Air, Land and Water. University of California Press.

Conley, D. J., H. W. Paerl, R. W. Howarth, D. F. Boesch, S. P. Seitzinger, K. E. Havens, C. Lancelot and G. E. Likens. 2009. Controlling eutrophication: nitrogen and phosphorus. *Science* 323:1014-1015.

Conley, D. J., H. W. Paerl, R. W. Howarth, D. F. Boesch, S. P. Seitzinger, K. E. Havens, C. Lancelot and G. E. Likens. 2009. Response to Letters 'Controlling eutrophication: nitrogen and phosphorus'. *Science* 324:721-725.

Cosentino, B. J., W. H. Lowe and G. E. Likens. 2009. Demography and movement of the northern spring salamander in four New Hampshire headwater streams. *Verh. Internat. Verein. Limnol.* 30(5):677-680.

Hairston, N. G., Jr. and G. E. Likens. 2009. The Legacy of James G. Needham: A Century of Limnology at Cornell University and the first course on Limnology in the Americas. *ASLO Bulletin* 18(2):30-32; and *SILNews* 54:25-27 (June 2009).

Kelly, V. R., K. C. Weathers, G. M. Lovett and G. E. Likens. 2009. Effect of climate change between 1984 and 2007 on precipitation chemistry at a site in northeastern USA. *Environ. Sci. Tech.* 43(10):3461-3466.

LaBaugh, J. W., D. C. Buso and G. E. Likens. 2009. Evaluation of methods and uncertainties in the chemical budgets. pp. 225-299. In: T. C. Winter and G. E. Likens (eds.). *Mirror Lake: Interactions among Air, Land and Water*. University of California Press.

Likens, G. E. 2009. A limnological introduction to Mirror Lake. pp. 1-21. In: T. C. Winter and G. E. Likens (eds.). *Mirror Lake: Interactions among Air, Land and Water*. University of California Press.

Likens, G. E. and J. W. LaBaugh. 2009. Mirror Lake: past, present and future. In: T. C. Winter and G. E. Likens (eds.). pp. 301-328. *Mirror Lake: Interactions among Air, Land and Water*. University of California Press.

Lindenmayer, D. and G. E. Likens. 2009. Adaptive monitoring: a new paradigm for long-term research and monitoring. *Trends in Ecology and Evolution (TREE)* 24(9):482-486.

Searchinger, T., S. P. Hamburg, J. Melillo, W. Chameides, P. Havlik, D. M. Kammen, G. E. Likens, R. M. Lubowski, M. Obersteiner, M. Oppenheimer, G. P. Robertson, W. H. Schlesinger and G. D. Tilman. 2009. Fixing a critical climate accounting error. *Science* 326:527-528.

Warren, D. R., C. E. Kraft, W. S. Keeton, J. S. Nunery and G. E. Likens. 2009. Dynamics of wood recruitment in streams of the northeastern U.S. *Forest Ecology and Management* 258(5):804-813.

Winter, T. C. and G. E. Likens. 2009. Summary and Conclusions. pp. 329-333. In: T. C. Winter and G. E. Likens (eds.). *Mirror Lake: Interactions among Air, Land and Water*. University of California Press.

Gleick, P. H. *et al.* [Likens, G. E.] + 255 signed authors. 2010. Climate change and the integrity of science. *Science* 328:689-690.

Kaushal, S. S., G. E. Likens, N. A. Jaworski, M. L. Pace, A. M. Sides, D. Seekell, K. T. Belt, D. H. Secor and R. L. Wingate. 2010. Rising stream and river temperatures in the United States. *Frontiers in Ecology and the Environment*; DOI:10.1890/090037

Likens, G. E. and D. C. Buso. 2010. Long-term changes in streamwater chemistry following disturbance in the Hubbard Brook Experimental Forest, USA. *Verh. Internat. Verein. Limnol.* 30(10):1577-1581.

Likens, G. E. and D. C. Buso. 2010. Salinization of Mirror Lake by road salt. *Water, Air and Soil Pollution* 205:205-214.

Lindenmayer, D. B. and G. E. Likens. 2010. The science and application of ecological monitoring. *Biological Conservation* 143(6):1317-1328.

Lindenmayer, D. B., G. E. Likens and J. F. Franklin. 2010. Rapid responses to facilitate ecological discoveries from major disturbances. *Frontiers in Ecology and the Environment*, DOI: 10.1890/090184

Mitchell, M. J., G. Lovett, S. Bailey, F. Beall, D. Burns, D. Buso, T. A. Clair, F. Courchesne, L. Duchesne, C. Eimers, I. Fernandez, D. Houle, D. S. Jeffries, G. E. Likens, M. D. Moran, C. Rogers, D. Schwede, J. Shanley, K. C. Weathers and R. Vet. 2010. Comparisons of watershed sulfur budgets in southeast Canada and northeast U.S.: new approaches and implications. *Biogeochemistry*, DOI:10.1007/s10533-010-9455-0.

Palmer, M. A., E. S. Bernhardt, W. H. Schlesinger, K. N. Eshleman, E. Foufoula-Georgiou, M. S. Hendryx, A. D. Lemly, G. E. Likens, O. L. Loucks, M. E. Power, P. S. White and P. R. Wilcock. 2010. Mountaintop mining consequences. *Science* 327:148-149.

Searchinger, T., S. P. Hamburg, J. Melillo, W. Chameides, P. Havlik, D. M. Kammen, G. E. Likens, R. M. Lubowski, M. Obersteiner, M. Oppenheimer, G. P. Robertson, W. H. Schlesinger and G. D. Tilman. 2010. Letter Response re: Fixing a critical climate accounting error. Carbon calculations to consider: Response. *Science* 327:780-781.

Searchinger, T., S. P. Hamburg, J. Melillo, W. Chameides, P. Havlik, D. M. Kammen, G. E. Likens, M. Obersteiner, M. Oppenheimer, G. P. Robertson, W. H. Schlesinger, R. M. Lubowski and G. D. Tilman. 2010. Letter Response re: Fixing a critical carbon accounting error – Bioenergy: Counting on incentives: Response. *Science* 327:1199-1201.

### ***Papers – In Press***

Judd, K. E., G. E. Likens, D. C. Buso and A. S. Bailey. 2010. Minimal response in watershed nitrate export to severe soil frost raises questions about nutrient dynamics in the Hubbard Brook Experimental Forest. *Biogeochemistry (In Press)*

Lake, P. S., G. E. Likens and D. S. Ryder. 2010. Integrating science, policy and management of rivers: Peter Cullen's legacy. *Marine and Freshwater Research (In Press)*

Likens, G. E. 2010. The role of science in decision making: Is anybody listening? *Frontiers of Ecology and the Environment (In Press)*

McGuire, K. J. and G. E. Likens. 2010. Historical roots of forest hydrology and biogeochemistry: Chapter 1. In: D. Levia, D. Carlyle-Moses and T. Tanaka (eds.). *Forest Hydrology and Biogeochemistry: Synthesis of Past Research and Future Directions (In Press)*

Pace, M. L., S. E. Hampton, K. E. Limburg, E. M. Bennett, E. M. Cooke, A. E. Davis, J. M. Grove, K. Y. Kaneshiro, S. L. LaDeau, G. E. Likens, D. McKnight, D. C. Richardson and D. L. Strayer. 2010. Individual ecologists: opportunities and rewards for engaging with environmental issues. *Frontiers in Ecology and the Environment (In Press)*

Ryder, D. S., M. Tomlinson, B. Gawne and G. E. Likens. 2010. Defining and using 'best available science'. A policy conundrum for aquatic ecosystem management. *Marine and Freshwater Research (In Press)*

### ***Papers – Submitted for Publication and In Revision***

Lindenmayer, D. B. and G. E. Likens. 2010. Direct measurement versus surrogate indicators for evaluating environmental change and biodiversity loss. *Ecosystems [In Revision]*

Svensson, T., G. Lovett and G. E. Likens. 2010. Is chloride a conservative ion in forest ecosystems? *Submitted for Publication.*

Warren, D. R., K. E. Judd, D. L. Bade, G. E. Likens and C. E. Kraft. 2010. Increases in nitrate uptake on following wood removal in two northeastern U.S. headwater streams. *Submitted for Publication.*

### ***Other Publications:***

Likens, G. E. 2010. Acid rain. In: C. J. Cleveland (ed.) *Encyclopedia of Earth*. (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). [First published in the *Encyclopedia of Earth* October 2006; Last revised January 2, 2010; <[http://www.eoearth.org/article/Acid\\_rain](http://www.eoearth.org/article/Acid_rain)>

Likens, G. E. and T. J. Butler. 2010. Acid rain. *Encyclopaedia Britannica (In Press)*  
<[http://www.eoearth.org/article/Acid\\_rain](http://www.eoearth.org/article/Acid_rain)>

Likens, G. E., T. J. Butler and M. A. Rury. 2010. Acid rain. *Encyclopedia of Global Studies. (In Press)*

### ***Reports***

Likens, G. E. 2010. A Strategic Plan for an Australian Long-term Environmental Monitoring Network. Report to Australian Government's Department of Environment, Water, Heritage and the Arts (DEWHA), May 2010. 39 pp.

Likens, G. E. 2010. Developing a basis for a Long-Term Ecological Research Network in Australia and a Systematic Approach to Environmental Monitoring. Final Fellowship Report to the Commonwealth for Environment Research Facilities (CERF), Department of Environment, Water, Heritage and the Arts (DEWHA), June 2010. Canberra, ACT, Australia. 14 pp.

### ***Abstracts***

Butler, T., F. Vermeulen, G. E. Likens, M. Rury and B. Lee. 2009. Regional impacts of reduced NO<sub>x</sub> emissions on ozone concentrations in the eastern USA: maximum O<sub>3</sub> levels reduced by 10%. *National Atmospheric Deposition Program (NADP) Annual Meeting and Scientific Symposium Abstract and Poster, Saratoga Springs, NY. October 2009.*

Likens, G. E. 2009. Ecosystem science, environmental change and society. *Abstract for Graduate School of Chinese Academy of Sciences, Nanjing, China. October 2009.*

Likens, G. E. 2009. Long-term, air-land-water interactions: Assessing Human-Accelerated Environmental Change. *Abstract for Einstein Lecture, Chinese Academy of Sciences, Nanjing, China. October 2009.*

Likens, G. E. 2009. Long-term nitrogen dynamics in a temperate forest ecosystem. *Abstract for Agouron Institute Nitrogen Symposium, Scottsdale, AR. October 2009.*

Likens, G. E. 2009. Water: A challenging interface between scientific understanding and policy. *SIL Abstract, SIL Symposium on Global Change and Freshwater Environments. Chinese Academy of Sciences and International Society of Limnology, Nanjing, China. October 2009.*

Mitchell, M. J., G. Lovett, S. Bailey, F. Beall, D. Burns, D. Buso, T. A. Clair, F. Courchesne, L. Duchesne, C. Eimers, D. Houle, D. Jeffries, G. Likens, S. Norton, D. Schwede, J. Shanley, K. Weathers and R. Vet. 2009. Discrepancies in Watershed S Budgets in Southeast Canada and Northeast U.S.: A Comparison of Mass-Balance Approach. *Abstract for American Geophysical Union (AGU) Meeting, San Francisco, CA. December 2008; and National Atmospheric Deposition Program (NADP), Saratoga Springs, October 2009.*

Torgersen, C. E., G. E. Likens, D. C. Buso, K. J. McGuire and W. H. Lowe. 2010. Linking network patterns and processes of streamwater chemistry across scales in Hubbard Brook Valley. *Abstract for Joint Meeting of American Society of Limnology and Oceanography (ASLO) and North American Benthological Society (NABS), Aquatic Sciences: Global Changes from the Center to the Edge, p. 233. Santa Fe, NM. June 2010.*

***Collaborators' Publications***

Gulati, Ramesh. 2009. Shaking Hands with a Limnologist: The Great Limnologist – Gene E. Likens. *SILnews* 55 (December 2009): 33-34.

Lewis, W. M. 2010. Gene Likens: A Leader for our Science. pp. 27-31. In: P. Gastescu (ed.). *Lakes, Reservoirs and Ponds*. Romanian Limnogeographical Association.

**GRANTS TO CARY INSTITUTE OF ECOSYSTEM STUDIES - CONTINUING OR RECEIVED**

1. Principal Investigator – “Long-term Ecological Research [LTER] at the Hubbard Brook Experimental Forest.” Subcontract from Cornell University, NSF OSP4432: 1988-2013.
2. Principal Investigator – Research in connection with CASTNet – Site 510 and NDDN Site #110, Ithaca, New York.” QST / U.S. Environmental Protection Agency. 1992-2010.
3. Principal Investigator – “Monitoring Precipitation Chemistry at Ithaca Site.” National Oceanic and Atmospheric Administration. 1992-2010.
4. Principal Investigator – “LTREB: Collaborative Research: Hydrologic-Nutrient Cycle Interaction in Small, Undisturbed and Human-Manipulated Ecosystems.” National Science Foundation. 1993-2013.
5. Principal Investigator – “Monitoring Site 109.” QST / U.S. Environmental Protection Agency. 1998-2010.
7. Principal Investigator – “NO<sub>x</sub> Research Project.” U.S. Environmental Protection Agency. 2000-2011.

**HONORS/AWARDS**

Awarded Australian Commonwealth Environment Research Facilities (CERF) Fellowship at Australian National University, Canberra, Australia. September 2009 – May 2010.

Awarded Einstein Professorship from the Chinese Academy of Sciences. March 2009.

Honorary Professorship, Jinan University, Guangzhou, China. November 2009.

**BOARD MEMBERSHIPS AND ACTIVITIES** (non-Cary Institute of Ecosystem Studies; offices held; memberships in; etc.)

1. Honorary Trustee, Board of Trustees, Environmental Defense Fund, New York, New York, 2005-*present*.
2. Board of Trustees, Hubbard Brook Research Foundation, Hanover, New Hampshire; 1998-*present*
3. Board of Directors and Vice Chair, Aldo Leopold Foundation, Inc., Baraboo, Wisconsin; 1997-2007; 2008-*present*.
4. Societas Internationalis Limnologiae (SIL) Member, Naumann-Thienemann Committee, 2007-*present*.
5. Board of Directors, Scenic Hudson, 2007-2009.
6. Honorary Board Member, Friends of Mirror Lake Association (FMLA), North Woodstock, New Hampshire. 2007-*present*.
7. Board of Trustees, Hudson River Foundation, New York. 2007-*present*.

**ADVISORY PANEL/COMMITTEE MEMBERSHIPS AND EDITORSHIPS**

1. Elected U. S. National Representative to Societas Internationalis Limnologiae [organizational name change to International Society of Limnology] (SIL), 1970-2001; 2007-*present*; Naumann-Thienemann Committee, 2001-*present*.
2. Chairman, Scientific Advisory Committee of the Joseph W. Jones Ecological Research Center at Ichauway Plantation, Newton, Georgia, 1988-*present*.
3. Elected, Scientific Coordinating Committee/Committee of Scientists of the Hubbard Brook Ecosystem Study, 2003-*present*.
4. Chairman, Hubbard Brook Ecosystem Study Information Oversight Committee, 2002-*present*.
5. Member, Advisory Board, *Ecosystems*, 1997-*present*.
6. Editor-in-Chief, Encyclopedia of Inland Waters, Elsevier, Academic Press, 2005-2009.
7. Invited to Review Program, The Thomas Foundation. Noosaville, Queensland, Australia. April 2010.
8. Invited to participate in the “High Level Review of the Proposed Basin Plan” as Eminent Reviewer, Murray Darling Basin Authority, Canberra, ACT, Australia. May 2010.

**LECTURES/OTHER PRESENTATIONS**

7 July 2009 -- Hubbard Brook Annual Cooperator's Meeting @ USFS, North Woodstock, NH:

1. Children's Story
2. Biogeochemical legacies of disturbance

24 July 2009 – REU visitation to Hubbard Brook...at Robert S. Pierce Ecosystem Laboratory, USFS, North Woodstock, NH

1. The Hubbard Brook Ecosystem Study: Then and Now
2. Scientific Ethics for Undergraduates

20-23 July 2009 -- At-Large H. Burr Steinbach Scholar, Massachusetts Institute of Technology and the Woods Hole Oceanographic Institution, Woods Hole, Massachusetts.

1. "Acid Rain: An Unfinished Environmental Problem" @ Woods Hole Oceanographic Institution, Quisset campus (Carriage House) [21 July 2009]
2. "The biogeochemistry of nitrogen at Hubbard Brook --- long-term research, theory and policy." @ Redfield Auditorium, Woods Hole Research Center. [22 July 2009]
3. "Ethics in the Scientific Workplace" lecture and workshop @ Woods Hole Oceanographic Institution, Quisset campus (Carriage House) [23 July 2009]

4 August 2009 – 94<sup>th</sup> Ecological Society of America, Albuquerque, NM.

Invited Lecturer, Session on Special Series on Coupled Biogeochemical Cycles. "Using watershed-scale, experimental manipulation to gain insights into coupled biogeochemical cycles".

7 September 2009 – Conservation and Landscape Ecology (CLE) Invited Speaker, "Dynamics of Nitrogen Biogeochemistry", Fenner School of Environment and Society, Australian National University, Canberra.

17 October 2009 – Agouron Institute Meeting, "Long-Term Nitrogen Dynamics in a Temperate Forest Ecosystem", Scottsdale, Arizona.

24 October 2009 – International Society of Limnology (SIL) Plenary Lecture, "Water: A challenging interface between scientific understanding and policy", Nanjing, China.

27 October 2009 – Conclusion Remarks, The Symposium of the International Society of Limnology (SIL), Nanjing Institute of Geography and Limnology, and Chinese Academy of Sciences. Nanjing, China.

31 October 2009 – Concluding Remarks at meeting with Three Gorges Dam officials, China.

3 November 2009 – Einstein Professorship Lecture, "Long-Term, Air-Land-Water Interactions: Assessing Human-Accelerated Environmental Change", Chinese Academy of Sciences, Nanjing, China.

4 November 2009 – Graduate School of the Chinese Academy of Sciences – “Ecosystem Science, Environmental Change and Society”, Beijing, China.

5 November 2009 – Round Table talk and discussion with graduate students, Graduate School of the Chinese Academy of Sciences, Beijing, China.

6 November 2009 – Honorary PhD Lecture – “Limnology, the Queen of the Natural Sciences, its role in understanding water resource protection and use”, Jinan University, Guangzhou, China.

8 November 2009: Lecture at South China Botanical Garden – “Long-term air-land-water interactions: Assessing Human-accelerated environmental change”, Guangzhou, China.

17 December 2009: Invited Public Lecture, Department of Ecology and Evolutionary Biology, University of Connecticut-Storrs, "Role of Science in Decision Making - Is Anybody Listening?"

1 March 2010 – Conservation and Landscape Ecology (CLE) Invited Speaker, “Effective Ecological Monitoring”, Fenner School of Environment and Society, Australian National University, Canberra.

6 April 2010 -- Conservation and Landscape Ecology (CLE) Invited Speaker, “Mountain-top coal mining in the U.S.”, Fenner School of Environment and Society, Australian National University, Canberra.

21 April 2010 -- Presented Keynote Address, “Measuring Progress – Resource Condition: Assessing Human-Accelerated Environmental Change,” to National Natural Resource Management Knowledge Conference, Darwin, NT, Australia. [conference 20-22 April 2010]

26 April 2010 – Plenary Speaker and Workshop Synthesizer for Meeting of Motueka Integrated Catchment Management Workshop, 10-year anniversary meeting, Nelson, New Zealand. “Integrated Research, Monitoring and Management at the Catchment Scale (from rainwater to the sea and everything in between)” [workshop, 26-29 April 2010].

5 May 2010 – Presentation, “A Strategic Plan for an Australian Long-Term Environmental Monitoring Network” to Australian Government’s Department of Environment, Water, Heritage and the Arts (DEWHA) for Commonwealth Environment Research Facilities (CERF) Fellowship.

10 May 2010 – Invited Speaker, National Water Commission, “Role of Long-term Monitoring in Assessing Human-Accelerated Environmental Change”, Canberra, Australia.

14 May 2010 – Invited Lecturer, “The role of science in decision making: Is anybody listening? Does evidence-based science drive environmental policy?” Human Ecology Forum, Forestry School, Australian National University

29 June 2010 – Invited Keynote Speaker, “Mirror Lake: Insights from Long-Term Studies,” Hubbard Brook Research Foundation Consortium Annual Meeting, Plymouth State University, Plymouth, NH.

### *Other Presentations*

7 October 2009 – Mitchell, M. J., G. Lovett, S. Bailey, F. Beall, D. Burns, D. Buso, T. Clair, F. Courchesne, L. Duchesne, C. Eimers, I. Fernandez, D. Houle, D. Jeffries, G. E. Likens, D. Schwede, J. Shanley, K. Weathers and R. Vet. 2009. Comparisons of watershed sulfur budgets in southeast Canada and northeastern U.S.: new approaches and applications. *PowerPoint posted on website for NADP Annual Meeting and Scientific Symposium, Saratoga Springs, NY.*

### **SCIENTIFIC MEETINGS**

Hubbard Brook Ecosystem Study —

- 8 July 2009 – *HBES Scientific Coordinating Committee (SCC) Meeting*, US Forest Service, Robert S. Pierce Ecosystem Laboratory, North Woodstock, New Hampshire.
- 8 July 2009 – *Hubbard Brook Committee of Scientists (COS) Meeting*, US Forest Service, Robert S. Pierce Ecosystem Laboratory, North Woodstock, New Hampshire.

4 August 2009 – Ecosystems, Advisory Board (annual meeting), Albuquerque, NM

17 August 2009 – Meeting with DEWHA, John Gorton Building, Canberra, Australia, regarding the National Environmental Accounts program, importance of fundamental data sets required to drive the National Environmental Accounts program, role of the TERN program in environmental monitoring.

21 August 2009 – Luncheon meeting with Board members of the Murray-Darling Basin Authority (Michael Taylor, Chair, Rob Freeman, Chief Executive, and Barry Hart, Member) to discuss the Authority's Basin Plan.

25 August and 4 September 2009; 29 January, 2 and 19 March 2010 – Meetings to discuss long-term environmental monitoring in Australia and DEWHA's National Environmental Accounts program. ANU Hancock Building, Fenner School of Environment & Society, The Australian National University, Canberra, ACT, Australia.

14-19 October 2009 – Agouron Institute Nitrogen Meeting, Scottsdale, AZ

23-27 October 2009 – SIL (International Society of Limnology) Meeting, Nanjing, China.

31 October 2009 – Concluding Remarks at meeting with Three Gorges Dam officials, China.

1-4 December 2009 – Chaired Scientific Advisory Committee, Joseph Jones Center, Ichauway, Newton, GA.

10 December 2009 – Attended Hudson River Foundation Board Meeting, New York, NY.

22-23 March 2010 – Field-Site Review of Victoria Central Highlands wet ash-forest long-term project (with D. Lindenmayer, S. Banks, D. Blair, M. Bourke, R. Cunningham, P. Gibbons, R. Hobbs, C. Krebs, and L. McBurney).

24-25 March 2010 – Field-Site Review of Nanangroe SW Woodlands long-term project (with D. Lindenmayer, M. Crane, R. Cunningham, R. Hobbs, P. Gibbons, G. Kay, C. Krebs, D. Michael, and R. Montague-Drake)

9 April 2010 – Attended Workshop, Toolangi Discovery Center, Victoria: Victorian Department of Sustainability and Environment, Post-Fire Ecological Recovery, regarding Victoria Central Highlands wet-ash-forest long-term project.

13-16 March 2010 – Visit and review of Warra Long-Term Ecological Research group in Tasmania; 17-19 April 2010 – Australian Canopy Crane Research Facility, Cape Tribulation, Queensland, Australia; 20 April 2010 – Kakadu Long-Term Research Site, Northern Territory, Australia.

30 April 2010 – The Thomas Foundation Board Meeting, presented review of Thomas Foundation program to Board Members, Noosaville, Queensland, Australia.

5 May 2010 – Presentation of Long-Term Environmental Monitoring Proposal, “A Strategic Plan for an Australian Long-Term Environmental Monitoring (LTEM) Network” to DEWHA at 5 Farrell Place, Canberra. The full report was submitted to Minister for Environment Peter Garrett on 29 May 2010.

#### **MEMBERSHIPS IN AND SERVICE TO PROFESSIONAL SOCIETIES**

American Association for the Advancement of Science (*Fellow 1965*)  
 American Institute of Biological Sciences (*President Elect 2001; President 2002; Past President 2003*)  
 American Polar Society  
 American Society of Limnology and Oceanography (*Vice President 1975-76; President 1976-77*)  
 American Water Resources Association (*Honorary Member*)  
 Australian Society of Limnology  
 The British Ecological Society (*Honorary Member, elected 1991*)  
 Ecological Society of America (*Vice President 1978-79; President 1981-82*)  
 Foreign Correspondents' Club of Japan (*Honorary Member; 2003-2004*)  
 Freshwater Biological Association  
 Gamma Alpha  
 The Hudson River Environmental Society  
 INTECOL (*elected Honorary Member, 2005*)  
 International Water Resources Association (*Charter Member*)  
 International Association for Great Lakes Research  
 International Association for Sediment Water Science  
 Phi Sigma  
 Societas Internationalis Limnologiae (*U.S. National Representative since 1970; Executive Vice President 1998-2001; President 2001-2007*); 2007, name changed to *International Society of Limnology*, but also retaining *SIL (Societas Internationalis Limnologiae)*.  
 Sigma Xi

### **SERVICE AS REVIEWER**

Proceedings of National Academy of Sciences  
National Science Foundation (grant proposals and committee reports)  
Elsevier  
Numerous Faculty Promotion and Award Reviews  
The Thomas Foundation  
The Murray Darling Basin Authority

### **GRADUATE STUDENTS**

Adam Wilson, Male, Ph.D. student, Ecology & Evolutionary Biology Department, University of Connecticut-Storrs, Member of Ph.D. Committee, 2008-present.

### **CARY INSTITUTE OF ECOSYSTEM STUDIES' COMMITTEES**

Monitoring Committee

### **MEDIA, POLICY-MAKING, AND OTHER PUBLIC EDUCATION**

#### **Media:**

20 April 2010 – Interview on ABC Radio on “Long-Term Research and Monitoring,” Darwin, Northern Territory, Australia

#### **Policy-Making:**

DEWHA / Murray Darling Basin Authority (see above)

#### **Public Education:**

- Editor-in-Chief, Encyclopedia of Inland Waters, Academic Press, Elsevier, 2005-2009
- Likens and his research team (Buso, Wooster, Minicucci, P. Likens,) at Hubbard Brook:
  - Contributed to the development of a comprehensive Web page for the Hubbard Brook Ecosystem Study (HBES) ([www.hubbardbrook.org](http://www.hubbardbrook.org)). Likens chairs the HBES Information Oversight Committee.
  - Led tours of the Hubbard Brook Experimental Forest and Mirror Lake for local, regional and international groups of visiting scientists, the staff of area politicians, community and environmental leaders, and members of the public.
  - Assisted and interacted with the Friends of Mirror Lake Association (Likens is an Honorary Board Member)

- Supervised the use of Likens' long-term HBES website data in reports and school exercises in response to numerous student e-mail requests.

### RESEARCH ACTIVITIES

Starting with two major discoveries from research in the 1960s at the Hubbard Brook Experimental Forest (HBEF) in the White Mountains of New Hampshire (discovery of acid rain in North America, Likens et al. 1972) and major disruption of the nitrogen cycle caused by forest disturbance such as cutting and harvest (Likens et al. 1970), my long-term research has continued to address questions at the ecosystem-scale in terrestrial and aquatic ecosystems, with relevance to natural resource management. Experimental manipulation of entire watershed-ecosystems at HBEF has been a powerful tool in these studies. Continuous records of precipitation and streamwater chemistry, now spanning 47 years are the longest in the world and provide unique insights about the functioning of and change in these ecosystems. Analyses of these long-term data ([www.hubbardbrook.org](http://www.hubbardbrook.org)) have led to some 1450 scientific published papers, 9 books and 150 Ph.D. + M.S. dissertations, and over 50 Honors theses, from the Hubbard Brook Ecosystem Study (HBES). I co-founded the Hubbard Brook Ecosystem Study in 1963.

- Acid rain in North America was first discovered at HBEF in the early 1960's. Research on acid rain and the acidification of soils and surface waters at Hubbard Brook produced data that played a major, influential role in U.S. and international assessments of the scientific, economic and political aspects of this environmental problem. This environmental problem has not been solved and the research continues.
- Harvesting trees by clear-cutting is an important management practice of the northern hardwood forest. Research at HBEF to quantify the effects of clear-cutting has been instrumental in the development of techniques to minimize the impacts of clear-cutting on forests, streams and lakes. Recommendations emanating from the HBES regarding sustainable forest harvest provided the basis for harvesting protocols in northern hardwood forest ecosystems (Likens et al. 1978).
- In the mid-1960's aquatic studies were initiated on Mirror Lake, located at the base of the Hubbard Brook Valley. Today Mirror Lake is one of the most intensively studied lakes in the world. The data from this research has provided critical information for the management of lake ecosystems and their watersheds. A second book about Mirror Lake was published in 2009 (Winter and Likens 2009).

My research focuses on the ecology and biogeochemistry of forest and aquatic ecosystems. These long-term studies have influenced policy decisions regarding management of natural resources and helped to guide managers and policymakers worldwide. For over 46 years, I have been working with colleagues from federal agencies, universities and NGOs on the effects of human-accelerated ecological change (Likens 1991) within the HBEF. Our goal has been to investigate how disturbance impacts diverse biological, physical, chemical and hydrological parameters of terrestrial and aquatic ecosystems within the Hubbard Brook Valley.

### References Cited

- Likens, G. E. 1991. Human-accelerated environmental change. *BioScience* 41(3):130.  
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