#### Kevin H. Gardner

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# Biographical Overview

My experience as a registered Professional Environmental Engineer and Ph.D. in Civil and Environmental Engineering prepared me for my current role as the Executive Vice President for Research and Innovation and a Professor of Civil and Environmental Engineering at the University of Louisville (UofL). Over my research career I have published over 60 manuscripts and received research funding in excess of \$60 million from the National Science Foundation (NSF), Environmental Protection Agency (EPA), the Strategic Environmental Research and Development Program (the Department of Defense's (DOD) environmental science and technology program), and the Environmental Security Technology Certification Program (ESTCD), DOD's environmental technology demonstration and validation program, among other agencies. My work has focused on understanding how contaminants become available to be released to the natural environment, and from there how they can lead to human exposure. This includes how they move into complex aquatic food chains, and importantly, my work has focused on approaches and technologies that can interrupt the pathways that ultimately lead to human exposure.

#### **Key Accomplishments and Positions**

Executive Vice President for Research and Innovation, University of Louisville Oversees the university's research enterprise, including research development and administration, industry engagement and technology commercialization.

Vice Provost for Research, University of New Hampshire

Served in the research office for nine years as Director of Strategic Initiatives and then Vice Provost for Research and have been responsible for a number of different initiatives, providing vision, acquiring funding, and leading them through completion. A few of these are highlighted below:

- Achieving R1 Carnegie Status. Led the reverse-engineering of the Carnegie ranking system and developed strategy to ensure that UNH moved from R2 to R1 (December, 2018).
- Development and roll-out of the NH University Research and Industry Plan. A statewide plan that has resulted in legislative action, adoption by UNH corporate engagement and by the state economic development agency.
- FindScholars@UNH. A new initiative that uses information technology to enable the Research Office, Centers, Institutes and others to demonstrate areas of global and national competitiveness, to communicate research excellence and the value of research to the University and State.
- Communicating Research. An initiative to more effectively build our research brand among stakeholders across the US, NH and UNH.

Director, Environmental Research Group

I led the Group, a major Center focused on environmental science and engineering, from 2004-2010 with expenditures of \$4-\$5 million per year, through its first strategic planning exercise and through the late 2000s when earmarked funds were no longer available. Expenditures remained consistent through a difficult funding environment.

Director, Recycled Materials Resource Center

I served as Director of this Center, and successfully re-competed for the Center in 2007. This Center had annual expenditures of approximately \$1.3 million and reported to the Director of the Environmental Research Group.

Professor, Civil and Environmental Engineering

I have a research focus on interdisciplinary environmental science and engineering topics, have been PI or Co-PI on over \$60 million in competitively funded external grants and contracts, have published over 100 articles, chapters, proceedings and reports, including over 60 peer-reviewed publications, and have advised over 40 graduate students.

### **Education**

## Clarkson University

Ph.D., Civil and Environmental Engineering (1996) M.S., Civil and Environmental Engineering (1991) <u>Union College</u>

B.S., Civil Engineering cum laude (1989)

**Professional Registration:** P.E., State of Ohio (E-62917)

## **Professional Experience**

Director Strategic Initiatives/Vice Provost for Research, 2010-2019

Associate/ State Director, NH EPSCoR, 2010-2109

Professor, University of New Hampshire, 2011-2019

Director, Environmental Research Group, 2004 - 2010

Mr. and Mrs. Robert C. Davison Professorship in Environmental Engineering, 2004-2007

Associate Professor, University of New Hampshire, 2006-2011

Director, Recycled Materials Resource Center, January 2005-2011

Associate Research Professor, University of New Hampshire, 2002-2006

Assistant Research Professor, University of New Hampshire, 1999-2002

George B. Mayer Assistant Professor, Case Western Reserve University, 1998 – 1999

Assistant Professor, Case Western Reserve University, 1996 - 1999

Instructor, Hofstra University, 1995 - 1996

Research Assistant, Clarkson University, 1992 - 1995

Associate Engineer, Industrial/Hazardous Waste Division, James M. Montgomery,

Consulting Engineers, Inc., Walnut Creek, California, 1991 1992

Research Assistant, Clarkson University, 1989 - 1991

### **Selected Honors and Distinctions**

- Association of Public Land Grant Universities Council on Research. Research Leader Fellowship, 2017.
- Waste Management Education & Research Consortium Memorial Faculty Award, 2005.
- Robert C. Davison Professorship in Environmental Engineering, 2004-2007.
- George B. Mayer Assistant Professorship of Urban and Environmental Studies, CWRU, 1998-1999.
- T. Keith Glennan Fellowship (for innovations in teaching), 1999-2000.
- Ph.D. Fellowship, Charles Stewart Mott Foundation / International Association of Great Lakes Research, 1993-1995.
- Larson Aquatic Research Support Master's Scholarship, American Water Works Association, 1990.

#### **Refereed Publications**

- Evans, A. D., Gardner, K. H., Greenwood, S., & Pruitt, B. (2020). Exploring the utility of small unmanned aerial system products in remote visual stream ecological assessment. *Restoration Ecology*, 28(6), 1431-1444. doi:10.1111/rec.13228
- Cheney, D., Logan, J. M., Gardner, K., Sly, E., Wysor, B., & Greenwood, S. (2019). Bioaccumulation of PCBs by a seaweed bloom (Ulva rigida) and transfer to higher trophic levels in an estuarine food web. *MARINE ECOLOGY PROGRESS SERIES*, 611, 75-93. doi:10.3354/meps12840
- Roy, S. G., Uchida, E., de Souza, S. P., Blachly, B., Fox, E., Gardner, K., Gold, A., Jansugwicz, J., Klein, S., McGreavy, B., Mo, W., Smith, S., Vogler, E. Wilson, K, Zydlewski, J., Hart, D. (2018). A multiscale approach to balance trade-offs among dam infrastructure, river restoration, and cost. *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*, 115(47),12069-12074. doi:10.1073/pnas.1807437115
- Stang, S., Wang H., Gardner, K. H., & Mo, W. (2018). Influences of water quality and climate on the water-energy nexus: A spatial comparison of two water systems. JOURNAL OF ENVIRONMENTAL MANAGEMENT, 218, 613-621. doi:10.1016/j.jenvman.2018.04.095
- Mo, W., Lu, Z., Dilkina, B., Gardner, K., Huang, J.-C., & Foreman, M. C. (2018). Sustainable and Resilient Design of Interdependent Water and Energy Systems:

- A Conceptual Modeling Framework for Tackling Complexities at the Infrastructure-Human-Resource Nexus. *Sustain ability*, 10(6), 1-10.
- Song, C., Gardner, K. H., Klein, S. J. W., Souza, S. P., & Mo, W. (2018). Cradle-to-grave greenhouse gas emissions from dams in the United States of America. RENEWABLE & SUSTAINABLE ENERGY REVIEWS, 90, 945-956. doi:10.1016/j.rser.2018.04.014
- Clausen, J. L., Georgian, T., Gardner, K. H., & Douglas, T. A. (2018). Optimization of Field and Laboratory Sample Processing for Characterization of Metallic Residues at Military Training Ranges. BULLETIN OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY, 100(5), 603-608. doi:10.1007/s00128-018-2311-y
- Mo, W., Balen, D., Moura, M., & Gardner, K. H. (2018). A Regional Analysis of the Life Cycle Environmental and Economic Tradeoffs of Different Economic Growth Paths. SUS TA INABILITY, 10(2). doi:10.3390/su10020542
- Clausen, J. L., Georgian, T., Gardner, K. H., & Douglas, T. A. (2018). Inadequacy of Conventional Grab Sampling for Remediation Decision-Making for Metal Contamination at Small-Arms Ranges. BULLETIN OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY, 100(1), 147-154. doi:10.1007/s00128-017-2255-7
- Clausen, J. L., Georgian, T., Gardner, K. H., & Douglas, T. A. (2018). Applying Incremental Sampling Methodology to Soils Containing Heterogeneously Distributed Metallic Residues to Improve Risk Analysis. BULLETIN OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY, 100(1), 155-161. doi:10.1007/s00128-017-2252-x
- Samal NR, Wollheim WM, Zuidema S, Stewart RJ, Zhou Z, Mineau MM, Borsuk ME, Gardner KH, Glidden S, Huang T, Lutz DA, Mavrommati G, Thorn AM, Wake CP, Huber M (2017). A coupled terrestrial and aquatic biogeophysical model of the Upper Merrimack River watershed, New Hampshire, to inform ecosystem services evaluation and management under climate and land-cover change. *ECOLOGY AND SOCIETY*, 22(4). doi:10.5751/ES-09662-220418
- Hadnagy, E., Gardner, K. H., Chesner, W. H., Justus, H., Forgione, M., & Maxwell, G. (2015). Pilot-scale evaluation of an in situ amendment delivery and mixing device for contaminated sediment remediation applications. JOURNAL OF SOILS AND SEDIMENTS, 15(2), 480-489. doi:10.1007/s11368-014-1007-0
- Bhatt, M. P., McDowell, W. H., Gardner, K.H., Hartmann, J. (2014). Chemistry of the heavily urbanized Bagmati River system in Kathmandu Valley, Nepal: export of organic matter, nutrients, major ions, silica, and metals. *Environmental Earth Sciences*, 71(2), 911-922. doi:10.1007/s12665-013-2494-9
- Nuss, P., Gardner, K. H., & Bringezu, S. (2013). Environmental Implications and Costs of Municipal Solid Waste-Derived Ethylene. JOURNAL *OF INDUSTRIAL ECOLOGY*, 17(6), 912-925. doi:10.1111/jiec.12066

- Rogers, S. H., Gardner, K. H., & Carlson, C. H. (2013). Social Capital and Walkability as Social Aspects of Sustainability. *SUS TA INABILITY*, 5(8), 3473-3483. doi:10.3390/su5083473
- Carpenter, A., Jambeck, J. R., Gardner, K., & Weitz, K. (2013). Life Cycle Assessment of End-of-Life Management Options for Construction and Demolition Debris. JOURNAL OF INDUSTRIAL ECOLOGY, 17(3), 396-406. doi:10.1111/j.1530-9290.2012.00568.x
- Nuss, P., Gardner, K. H., & Jambeck, J. R. (2013). Comparative Life Cycle Assessment (LCA) of Construction and Demolition (C&D) Derived Biomass and US Northeast Forest Residuals Gasification for Electricity Production. *ENVTRONMENTAL SCIENCE & TECHNOLOGY*, 47(7), 3463-3471. doi:10.1021/es304312f
- Nuss, P., & Gardner, K. H. (2013). Attributional life cycle assessment (ALCA) of polyitaconic acid production from northeast US softwood biomass. INTERNATIONAL JOURNAL OF LIFE CYCLE ASSESSMENT, 18(3), 603-612. doi:10.1007/s11367-012-0511-y
- Nuss, P., Bringezu, S., & Gardner, K. H. (2012). Waste-to-Materials: The Longterm Option. *Green Energy and Technology*, 55, 1-26. doi:10.1007/978-1-4471-2306-41
- Carlson, C., Aytur, S., Gardner, K., & Rogers, S. (2012). Complexity in Built Environment, Health, and Destination Walking: A Neighborhood-Scale Analysis. *JOURNAL OF URBAN HEALTH-BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE*, 89(2), 270-284. doi:10.1007/s11524-011-9652-8
- Rogers, S., Aytur, S., Gardner, K., & Carlson, C. (2012). Measuring community sustainability: exploring the intersection of the built environment & social capital with a participatory case study. *Journal of Environmental Studies and Sciences*, 2, 143-153.
- Saffarzadeh, A., Shimaoka, T., Wei, Y., Gardner, K. H., & Musselman, C. N. (2011). Impacts of natural weathering on the transformation/neoformation processes in landfilled MSWI bottom ash: A geoenvironmental perspective. *WASTE MANAGEMENT*, *31*(12), 2440-2454. doi:10.1016/j.wasman.2011.07.017
- Takahashi, F., Shimaoka, T., Gardner, K., & Kida, A. (2011). Size-dependent enrichment of waste slag aggregate fragments abraded from asphalt concrete. *JOURNAL OF HAZARDOUS MATERIALS*, 194, 209-215. doi:10.1016/j.jhazmat.2011.07.086
- Rogers, S. H., Halstead, J. M., Gardner, K. H., & Carlson, C. H. (2011). Examining Walkability and Social Capital as Indicators of Quality of Life at the Municipal and Neighborhood Scales. *APPLIED RESEARCH IN QUALITY OF LIFE, 6(2),* 201-213. doi:10.1007/s11482-010-9132-4
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- Carpenter, A. C., & Gardner, K. H. (2009). Use of Industrial By-Products in Urban Roadway Infrastructure. *JOURNAL OF INDUSTRIAL ECOLOGY*, 13(6), 965-977. doi:10.1111/j.1530-9290.2009.00175.x
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- Bhatt, M. P., Masuzawa, T., Yamamoto, M., & Gardner, K. H. (2009). Spatial variations in chemical compositions along Langtang-Narayani river system in central Nepal. ENVIRONMENTAL GEOLOGY, 57(3), 557-569. doi:10.1007/s00254-008-1325-x
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- Jiangying, L., Dimin, X., Lan, X., Hills, C., Carey, P., & Gardner, K. (2008). Comparison of properties of traditional and accelerated carbonated solidified/stabilized contaminated soils. JOURNAL OF ENVIRONMENTAL SCIENCES, 20(5), 593-598. doi:10.1016/S1001-0742(08)62099-9
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- Chakraborti, R. K., Gardner, K. H., Kaur, J., & Atkinson, J. F. (2007). In situ analysis of flocs. *JOURNAL OF WATER SUPPLY RESEARCH AND TECHNOLOGY-AQUA*, 56(1), 1-11. doi:10.2166/aqua.2007.063
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- Yatsalo, B. I., Kiker, G. A., Kim, J., Bridges, T. S., Seager, T. P., Gardner, K., Linkov, I. (2007). Application of Multicriteria Decision Analysis Tools to Two Contaminated Sediment Case Studies. *INTEGRATED ENVIRONMENTAL ASSESSMENT AND MANAGEMENT*, 3(2), 223-233. doi:10.1897/IEAM 2006036.1
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- Apul, D. S., Gardner, K. H., Eighmy, T. T., Fallman, A. M., & Comans, R. N. J. (2005). Simultaneous application of dissolution/precipitation and surface complexation/surface precipitation modeling to contaminant leaching. ENVIRONMENTAL SCIENCE & TECHNOLOGY, 39(15), 5736-5741. doi:10.1021/es0486521

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# **Graduate Student Supervision**

Served as primary advisor for 12 doctoral students and 29 M.S. students. Advised four post-doctoral research associates.

## Funded Proposals (PI unless otherwise noted)

- "RII-Track 1: New Hampshire Center for Multiscale Modeling and Manufacturing of Biomaterials (NH Bio-Made)," National Science Foundation, 2018-2020: **\$20** million (Brad Kinsey PI).
- "Resilience, Reliability, and Externalities of Integrated Centralized and Distributed Water and Energy Systems: The Integrated Water-Energy Dynamic (iWED) Model," National Science Foundation, 2017-2020: \$303,680 (Co-PI with Weiwei Mo PI).
- "Understanding Resilience, Reliability and Externalities of Integrated Centralized and Distributed Water," National Science Foundation, 2016-2019: **\$261,000** (Co-PI with Weiwei Mo PI and GaTech co-performers).
- "RII Track-2 FEC: Strengthening the Scientific Basis for Decision-Making About Dams: Multi-Scale, Coupled-Systems Research on Ecological, Social, and Economic Trade-Offs," National Science Foundation, 2015-2019: **\$6 million.**
- "Sustaining Coastal Systems: Linking Science and Decision-Making to Reduce Pollution-Related Impairment," National Science Foundation, 2013-2016: **\$6 million** (Co-PI with Jan Nisbet, PI).
- "Ecosystem Computing Challenge: Partnership Model to Build Access to Relevant Computing Education for Underrepresented High School Students," National Science Foundation, 2013- 2018: \$750,000 (Co-PI with Mihaela Sabin).
- "Interactions among Climate, Land Use, Ecosystem Services and Society," National Science Foundation, 2011-2016: **\$20 million** (Co-PI with Jan Nisbet, PI).

- "Impacts on Groundwater Quality following the Application of ISCO: Understanding the Cause of and Designing Mitigation for Metals Mobilization," Strategic Environmental Research and Development Program (SERDP), 2011-2014: **\$919,270.** (co-performers XDD and Battelle).
- "PLANET: PLatform for ANalyzing Environmental Trade-offs" US ACE SBIR Phase II Grant. Subcontractor to Aptima, Inc.: \$152,493.
- "Social Hotspot Database Development to Support Open-Source Social Life Cycle Assessment," University of Arkansas (as part of the Sustainability Consortium funding): **\$493,199.**
- "In Situ Wetland Restoration Demonstration," Environmental Security Technology Certification Program (PI for UNH, US Navy Project PI.), 2008-2011: **\$941,000**.
- "Impacts of in situ Treatment of Contaminated Sediments on the Benthic Communities of the Cocheco River, New Hampshire," New Hampshire Sea Grant (Jeb Byers Co-PI), 2008-20010: **\$130,000**.
- "Recycled Materials Resource Center," Federal Highway Administration (with Melton, Daniels, Gress), June 2007-May 2011: **\$4.26 million**
- "Enabling Technologies for Scientific Innovation through Sensor Development" National Science Foundation, 2007-2011: **\$7 million.**
- "Reactive Capping Mat Development and Evaluation for Sequestering Contaminants in Sediments," Strategic Environmental Research and Development Program (PI for UNH, US Navy Project PI. With J. Melton), April 2006-March 2010: **\$1.1 million**
- "Sediment Technology Test Site," Cooperative Institute for Coastal and Estuarine Environmental Technology (NOAA) (with J. Melton): Sept. 06-Aug. '11: \$1,319,601.
- "Developing a Critical Mass of Ph.D. Students In Sustainable Engineering" UNH Research Office and Graduate School (with all ERG faculty), 2007-2010: \$300,000.
- "Environmental and Economic Issues with Recycling Construction and Demolition Debris," President's Excellence in Research Awards, 2006-2007: \$50,000 (PI Jambeck, also with Halstead).
- "The Recycled Materials Resource Center," Federal Highway Administration (With Melton, Daniels, Gress), October 2005-May 2007: \$1.3 million.
- "Evaluation of the Industrial Waste Management Evaluation Model for Highway Beneficial Use Applications: US EPA, March 2005-March 2006: \$35,000
- "Geochemistry and Availability of Cadmium, Zinc, Arsenic, and Chromium in PCS Phosphate Land Reclamation Materials," PCS Phosphate (Melton PI): September '04-December '06: \$320,101.

- "Development of Updated Guidelines for the Beneficial Use of Foundry Sands, Coal Ash, and Construction and Demolition Debris," US EPA (with Melton, Jambeck), October 2005-September 2007: \$100,000.
- "Use of Organically-Modified Clays as Reactive Barriers for Mitigation of PAH Contamination in Sediments." Cooperative Institute for Coastal and Estuarine Environmental Technology (NOAA): June '04-June '05: **\$25,000.**
- "A System for Remediation of Polychlorinated Biphenyl in Sediments" Cooperative Institute for Coastal and Estuarine Environmental Technology (NOAA): Sept '03-Aug. '06 **\$373,610.**
- "Long-Term Effectiveness of Portland Cement-Based Solidification/Stabilization Treatment of Waste" The Portland Cement Association: Jan '03-Dec. '05: \$101,876.
- "Development of Technology for the Management of Contaminated Sediments and a Risk Analysis Product to Guide Decision Making" Cooperative Institute for Coastal and Estuarine Environmental Technology (NOAA) \*(with Ballestero, Seager, Melton): Sept. '02-Aug. '05: **\$1,112,101.**
- "Electrochemical Remediation and Stabilization of Contaminated Sediments" Cooperative Institute for Coastal and Estuarine Environmental Technology (NOAA): Sept '02-Aug. '04: **\$218,850.**
- "In-situ Treatment of PCBs in Marine and Freshwater Sediments using Colloidal Zero-Valent Iron" Cooperative Institute for Coastal and Estuarine Environmental Technology (NOAA): Sept. '01-Aug. '03: **\$219,014.**
- "Electrochemical Remediation of Sediments Placed in Confined Aquatic Disposal Cells," Cooperative Institute for Coastal and Estuarine Environmental Technology (NOAA): April '01-Oct. '01: **\$14,868.**
- "Demonstration of the In-situ Reductive Dechlorination of PCBs using Colloidal Zero-Valent Iron and Colloidal Pd°/Fe° Bimetallic Systems" Cooperative Institute for Coastal and Estuarine Environmental Technology (NOAA): Jan. '00-Dec.'00: \$8,943.
- "Structural Fill Material using Schiller Coal Fly Ash," Public Service of New Hampshire: Dec. '00-Nov.'01: **\$7,200.**
- "Development of Reuse Alternatives for the Management of Dredged, Contaminated Sediments," Cooperative Institute for Coastal and Estuarine Environmental Technology (NOAA): Sept.'00-Aug.'02 \$220,321.
- "REU Supplement to Investigation of Mechanisms of Surfactant-Induced Hydraulic Conductivity Changes in Soil Flushing Operations," National Science Foundation: May '00-Dec. '00 for \$5,000.
- "Investigation of Mechanisms of Surfactant-Induced Hydraulic Conductivity Changes in Soil Flushing Operations," National Science Foundation: Sept. '99-Aug. '02: \$383,703.

- "Mechanism-Based Analysis for Electrokinetically-Enhanced Aggregate Remediation" National Science Foundation: Sept. '99-Aug. '02 for **\$280,758** (Co-PI).
- "A New, Multidisciplinary Course on Solving Complex Environmental Problems," Glennan Fellows Program (CWRU): July '99-June '00 for **\$6,500**.
- "Placement for Coulter SA3100+ Surface Area and Pore Size Analyzer," Coulter Corporation: June '97-June '99 for **\$74,305.**
- "Initiatives in Multidisciplinary Environmental Engineering Education," The Hewlett Fund: September '98 June '99 for \$10,000 (Jennings PI).
- "Field Evaluation of the Lower Shaker Lake Draining Event: A Unique opportunity to gather essential information on Shaker Lake sediments." Northeast Ohio Regional Sewer District: June '97-January '98 for **\$24,982** (Jennings PI).
- "Mechanistic Evaluation of Colloid Aggregation Kinetics," Ohio Board of Regents: June '97-June '98 for **\$5,000**.
- "Shared Resources Modules to Support Environmental Engineering Education," National Science Foundation: August '97-August '98 for \$123,545 (Jennings PI).

# **University Service**

UNH Financial Conflict of Interest Disclosure Review Committee 2013-2019 (Chair 2016-2019)

Sustainability Dual Major Executive Committee 2016-2019

Honors Program Liaison, 2015-2019

Responsible Conduct of Research Training facilitator - 2012-2015

2013: Search Committee: Interim Senior Vice Provost for Academic Affairs

2013: Graduate School Review

2011: Committee Investigating new School of Earth and Environment

2010: UNH New Ventures Advisory Group

2010: Search Committee, Director for the Office of Research Partnerships and Economic Development

2009: Chair, Senior Vice Provost for Research Search Committee

2009-2015, 2017-2019: Natural Resources Earth Systems Science Ph.D. Program Executive Committee

2008-2009: Co-Chair, University Strategic Planning "Breaking Silos and Scrambling Categories" Work Group and member, Strategic Planning Steering Committee

2007-2008: Member, President's Blue Ribbon Panel on Research

2008-2009: Chair, Research Subcommittee of the UNH Faculty Senate 2007-2009:

University Senate, Civil Engineering Representative 2006-2012: UNH Energy Task

Force

2006-2010: CEPS Curriculum and Academic Planning Committee 2004-2006:

Chair, UNH Green Building Working Group

2004- 2005: College of Engineering and Physical Sciences Dean Search Committee

2005,2006; Judge: New Hampshire Science and Engineering Exposition

2004-2010: UNH Institutional Biosafety Committee

2002-2003: Provost search committee.

1998 - 1999: Advisor, First Year Experience Program (CWRU)

1998 - 1999: Advisory Committee for the CWRU Center for Science and Math Education

1997 - 1999: Graduate Studies Committee (CWRU)

1997 - 1999: Share the Vision Committee (CWRU)

1996-1997 Participant in "Connect with CWRU: Focus on Engineering and Physics." High School Teachers Workshop, to educate high school science and math teachers about Civil and Environmental Engineering.