Catherine H. Borer, Ph.D.

Associate Professor of Biology
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EDUCATION

University of Vermont (UVM). Ph.D., Natural Resources, 2004.
Dissertation: Calcium partitioning and depletion in the foliage of red spruce: Quantification, physiological consequences, and implications for forest health.
Advisor: Donald H. DeHayes
Areas of interest: plant physiological ecology, tree physiology, biogeochemistry

University of Vermont. M.S., Forestry, 1994.
Thesis: Eastern white pine response to chronic ozone exposure: visible injury and growth.
Advisor: Deane Wang
Areas of interest: pollution ecology, forest health, forest genetics

Yale University. Graduate studies in Biology. 1989-1990.

Grinnell College. B.A., Biology, 1987.

TEACHING

Instructor, introductory biology core courses: Principles of Biology, Principles of Cell Biology, Principles of Zoology, Principles of Microbiology and Botany, Berry College (fall 2006-present). Lecture and lab sections for introductory course sequence for biology majors. Course sequence serves as the foundation for the biology curriculum, and for other disciplines in the life sciences. Ongoing collaborative development of curriculum, courses, and assignments.

Instructor, Biological Diversity, Berry College (spring 2009-present). Developed and taught general education (non-majors) introductory biology course, including lecture and lab sections.

Instructor, Plant Physiology, Berry College (spring 2008, 2010, 2012, 2014, 2018). Developed and taught lecture, discussion, and lab course. This is an advanced-level, writing-intensive biology elective course.

Instructor, Biology of Plants in Our World, Berry College (spring 2015, 2017). Developed lecture, discussion and lab course. This is an advanced-level biology elective course.

Instructor, Nestled in a Bed of Greens: Biology of Useful Plants (fall 2017). Developed lecture, discussion and lab course; course development grant. This is a first-year colloquium that serves as a GenEd/Foundations lab science course for non-majors. Most students also participate in a Living/Learning Commons and concurrently take at least one additional course: Intro. to Environmental Studies, or a special section of English Composition.

Instructor, Cave Ecology, Berry College (summers 2015, 2017). Developed field-based lecture, discussion and lab course. This advanced-level elective course is cross-listed in Biology and Environmental Science. In 2007 it was also offered as a GenEd/Foundations lab science course for non-majors.

Instructor, Environmental Science Methods, Berry College (spring 2007, 2009, 2011, 2013, 2014). Upper-division majors course in environmental science. Developed and taught course for students to develop a scientific, structured approach to addressing the many facets of environmental problems. Course includes substantial long-term team projects, designed and completed by students, with a primary goal of developing local solutions to address global environmental challenges.

Instructor, Environmental Science Seminar, Berry College (spring 2016, 2017). Upper-division majors course emphasizing careers in environmental science.

Internship Advisor, Academic Internship (EVS 496; summer 2017). Keep Rome-Floyd Beautiful. Discussions via email and in person, as needed for guidance. Met with student and site supervisor to discuss internship experience.

Mentor, Directed Study (BIO 498; spring 2011). Grant Writing for Educational Research and Program Development. Worked with student as he learned the grant searching and proposal writing process. Two products were a funding proposal and a poster presentation to enhance educational facilities at Rome's ECO center (riverfront environmental education center).

Instructor, Biology Senior Seminar, Berry College (fall 2009). Developed and taught advanced-level discussion course for Biology Majors. Overall topic for the semester was "Food". Discussions included topics such as human biology, plant biology, ecology, sustainability, agricultural processes, and related topics.

Instructor, First-year Seminar, Berry College (fall 2007). Taught course designed to orient new students to the college experience, the resources that are available to them, and the educational philosophy and style of Berry College. Academic advisor for these students.

Facilitator, Race and Culture in Natural Resources, UVM (fall 1999, fall 2005). Developed and facilitated weekly discussions with first-year undergraduate students. Discussions accompanied a series of invited lectures designed to familiarize students with varied issues of bias and discrimination in the context of Natural Resource professions.

Consultant, (spring 2004). Compiled and evaluated course materials I had developed for Measurement and Mapping of Natural Resources, and student feedback about the course. Evaluated the success of all aspects of the course, identified directions for future improvements, and assisted the current instructor in further course development.

Instructor/coordinator, Measurement and Mapping of Natural Resources, UVM (fall 2003). Developed, coordinated and taught intermediate-level course emphasizing quantitative and qualitative ecological assessment. Developed and coordinated a place-based service-learning project, to provide data for education and management at a university-owned natural area.

Facilitator, (fall 2001 - spring 2002). Created and implemented a website for an interdisciplinary intermediate-level course sequence in Natural Resources core curriculum, UVM. Wrote proposal and obtained funding support for curriculum development. Collaborated with interdisciplinary team of ecologists, social scientists, an education specialist and a website programmer.

Instructor, Environmental Problem Analysis, UVM (fall 2000 - spring 2001). Designed and taught intermediate-level interdisciplinary course. Provided students with conceptual bridges between ecological and social sciences, using environmental problems as case studies. Collaborated with social science Ph.D. student, and an interdisciplinary faculty team.

Teaching Assistant, Ecosystem Management (fall 1998 - spring 2000), Assessing Environmental Impacts (1993), Forest Ecology (1992), UVM. Taught introductory biology lab, Yale University (1990). Tutored introductory biology, Grinnell College (1987). Conceptualized, developed, programmed and maintained an extensive course website in Ecosystem Management.

Mentor, for Research Apprentice Program summer students (1992, 1994, 1996), designed to increase participation and experience in science of minority students; student internships (2000, 2002); high school science project (2005). Supervise student research, 1998-present.

RESEARCH

Associate Professor, Berry College (August 2013 - present). **Assistant Professor**, Berry College (August 2006 – May 2013). Primary research focus is physiological plant ecology. Projects address the relationships among ecological conditions, human activities and plant health. Current projects include investigations of Ca partitioning in the foliage of understory trees and shrubs, foliar Ca partitioning as a mechanism of tolerance of an extremely high-calcium site, conservation of the seaside alder in GA, and identification of plant roots growing in caves. Additional projects have examined the role of flowering dogwood in ecosystem Ca cycling, invertebrates in Ca cycling, nutrient resorption during foliar senescence, Al toxicity, modeling causes and consequences of red spruce decline, and evaluating methods for cave conservation. Student participation is a key component in all aspects of this work.

Postdoctoral Associate, UVM (May 2004 – July 2006). Research in physiological plant ecology: forest health consequences of human-induced calcium depletion and aluminum mobilization. Also, Vermont Program Manager, Northeastern States Research Cooperative competitive grants program (July 2005 – July 2006). Program direction and management, scientific oversight, and coordination of proposal review for competitive grants programs encompassing nearly $5 million of funded research projects. Also, oversight of technical review of proposals submitted to the Lake Champlain SeaGrant program and McIntire-Stennis Forestry Research program.

Graduate Research, UVM (Sept. 1998 – April 2004). Ph.D. Dissertation: Calcium partitioning and depletion in the foliage of red spruce: Quantification, physiological consequences, and implications for forest health.

Research Field Technician, UVM (May 1995 - Aug. 1998). Coordinated research to determine the ecological function of riparian areas adjacent to agricultural land. Refined and updated the basin-wide nonpoint phosphorus assessment for Lake Champlain.

Environmental Analyst, Living Technologies, Inc. (May 1997 - Aug. 1998). Analyzed efficiency, efficacy, and biological composition of an innovative biological wastewater treatment process. Educated the public about the facility.

Researcher, UVM (Feb. 1994 - May 1995). Developed techniques to assess membrane-associated calcium (mCa) in red spruce mesophyll cells. This led to a breakthrough in the understanding of red spruce decline, and allowed us to elucidate physiological mechanisms by which acidic precipitation reduces cold hardiness and predisposes trees to decline.

Graduate Research, UVM (Aug. 1991 - Feb. 1994). M.S. Thesis: Eastern white pine response to chronic ozone exposure: visible injury and growth.

Assistant Researcher, Yale University, School of Forestry and Environmental Studies (June 1990 - Aug. 1991). Developed and implemented a barcode-accessible computer database for over 10,000 physical samples that had been archived from environmental research projects; also did fieldwork, lab work, data analysis and presentation.

Graduate Research, Yale University Biology Department (Aug. 1989 - June 1990). Projects included yeast meiosis, and heavy metal accretion in regenerating vegetation.

Research Technician, Wistar Institute (Aug. 1987 - June 1989). Molecular genetics and cell biology of human cancer.

Independent Undergraduate Research, Grinnell College Biology Department (1986). Collembola species definition analysis via isozyme assessment and numerical taxonomy.

Research Assistant, Grinnell College Biology Department (Sept. 1984 - July 1987). Collembola taxonomy.

AWARDS and FUNDING

LiCor Environmental Education Fund (LEEF) Grant ($37,600), to be used toward the purchase of the LI-6800 LEEF3 Ecophysiology Package.

Richards Science Scholars Grant funding to Joshua Han, 2018 (C. Borer, mentor).

Professional Travel Grant from the Botanical Society of America for participation in the 2017 Annual Meeting of the Botanical Society of America and Partner Societies, June 24-28, 2017, Fort Worth, TX. Additional funding came from my invited talk and panel discussion in a special symposium about the Seaside Alder, a geographically unique species.

The Nature Conservancy, approved permit for collection of biological research samples at Black's Bluff Preserve. 2017, approved permit renewal 2018.

Southeastern Cave Conservancy, approved permit for collection of biological research samples at two Conservancy-managed preserves. 2017.

Southeastern Cave Conservancy, approved special use permit for educational visits to two preserves with Cave Ecology class. 2017.

DNA analysis of unknown plant root samples found in caves. 2016. Richards Undergraduate Grant to Erin Valek (C. Borer, mentor).

Species identification of plant roots in caves. 2016. Faculty Development Grant. Berry College.

First-year Colloquium course development grant for Nestled in a Bed of Greens: Biology of Useful Plants. 2016.

Meritorious Service Award for ten years of service – steadfast dedication in educating the head, heart, and hands of Berry Students. Berry College. May 9, 2016.

Summer Professional Development and Cultural Immersion Grant, for development of research collaborations and travel to southwestern China. 2015. Office of International Programs and Office of the Provost, Berry College.

Summer Course Development Grant, for Cave Ecology. 2014. Center for Teaching Excellence and the Office of the Provost, Berry College.

Synovus Sophomore Scholarship to Chandler Maddox (Berry College student). 2014. Patterns of vertebrate biodiversity in Tennessee, Alabama, and Georgia caves. Funding awarded in support of a student research project. C. Borer, faculty sponsor.

Senior Appreciation Award. 2014. Berry College Class of 2014. Nominated by research student John Keiler.

Follow-up evaluation of calcium partitioning and sequestration in plant foliage from White Sands National Monument, an extremely high-calcium site. 2013. Research collection permit approved and granted by the National Park Service. C. Borer, investigator.

Wilderness First Responder Training. 2013. Faculty Development Grant. Berry College.

Synovus Sophomore Scholarship to C. Kyle Daniel (Berry College student). 2012. Evaluation of calcium sequestration as a mechanism for tolerance of aluminum toxicity in flowering dogwood. Funding awarded in support of a student research project. C. Borer, faculty sponsor.

Mitigation of human waste on multi-day cave expeditions. 2011. Competitive grant from the Dogwood City Grotto of the National Speleological Society. C. Borer, R. Miller, A. Fortini, co-investigators.

Evaluation of calcium sequestration as a mechanism for tolerance of aluminum toxicity. Development of Undergraduate Research (DUR) funding through the School of Mathematical and Natural Sciences, Berry College (2011-2012). C. Borer, investigator.

Carol Willis Outstanding Student Organization Advisor Award. 2011. Berry College.
Eleana M. Garrett Award for Meritorious Advising and Caring. 2010. Berry College.

Synovus Sophomore Scholarship to Sarah Grace Sapp (Berry College student). 2010. Phenology of calcium and aluminum accretion and sequestration in dogwood foliage. Funding awarded in support of a student research project. C. Borer, faculty sponsor.

Colorimetric analysis of calcium in tree foliage and forest soils to elucidate Ca cycling processes. Development of Undergraduate Research (DUR) funding through the School of Mathematical and Natural Sciences, Berry College (2009-2010). C. Borer, investigator.

A preliminary evaluation of calcium partitioning and sequestration in plant foliage from White Sands National Monument, an extremely high-calcium site. 2008. Research collection permit approved and granted by the National Park Service. C. Borer, investigator.

Preliminary assessment of methodologies to reduce human impacts from urine deposition during multi-day cave expeditions. 2007. Competitive grant from the Dogwood City Grotto of the National Speleological Society. C. Borer, R. Miller, A. Fortini, co-investigators.

Understanding the influence of Ca depletion on tree health and recovery from stress. 2004-2008. Northeastern States research Cooperative. P. Schaberg, G. Hawley, C. Borer, co-authors. $40,000.

An evaluation of soil Ca:Al ratios, foliar Ca and Al partitioning, and forest health. 2003-2005. Northeastern States Research Cooperative. P. Schaberg, G. Hawley, C. Borer, co-authors. $81,638.

Centennial Woods: Data to enhance education and management in a "green classroom." 2004. Environmental Council, UVM. C. Borer and R. Paradis. $1,550.

Science to Achieve Results (STAR) Graduate Fellowship, Aug. 2000 – Aug. 2003. U.S. Environmental Protection Agency. This highly competitive national fellowship program funds roughly 10 percent of applicants annually. $80,904.

Graduate Student Award for Outstanding Service, School of Natural Resources, UVM. 2002.

Graduate Travel Mini-grant, spring 2002. For travel to the Fourth Biennial Conference on University Education in Natural Resources. Combined funding from Graduate College and School of Natural Resources, UVM. $600.

An interdisciplinary, collaborative approach to education in the School of Natural Resources: Website development to enhance linkages among core curriculum courses. Curriculum development grant from Center for Teaching and Learning and School of Natural Resources, UVM. 2001-2002. Co-PI: Peter Newman. $12,155.

Graduate teaching fellowships and research assistantships, School of Natural Resources, UVM, 2003-2004, 1998-2001, 1991-1993, and Yale University, 1989-1990.

National Science Foundation graduate research fellowship honorable mention, 1989.

Academic All American Collegiate Award, 1987. United States Achievement Academy.

PUBLICATIONS (underlined names denote Berry College student co-authors)

Borer, C.H. 2018. Cave conservation during exploration in areas of Lechuguilla Cave with interspersed dirty and clean zones. Canyons and Caves.

Borer, C.H., W.J. Stiles, J.C. Stevenson, and K.E. Cabanillas. 2014. Assessment of forward osmosis as a possible mitigation strategy for urine management during extended cave exploration. Journal of Cave and Karst Studies. 76(1): 26-29. DOI: 10.4311/2012LSC0269

Borer, C.H., S.G. Sapp, and L.H. Hutchinson. 2013. Flowering dogwood (*Cornus florida* L.) as mediator of calcium cycling: New insights are revealed by analysis of foliar partitioning. Trees: Structure and Function. 27(4): 841-849. DOI 10.1007/s00468-012-0838-9

Borer, C.H., M.N. Hamby, and L.H. Hutchinson. 2012. Plant tolerance of a high-calcium environment via foliar partitioning and sequestration. Journal of Arid Environments 85: 128-131. DOI 10.1016/j.jaridenv.2012.06.004

Schaberg P.G., B.E. Lazarus, G.J. Hawley, J.M. Halman, C.H. Borer, and C.F. Hansen. 2011. Assessment of weather-associated causes of red spruce winter injury and consequences to aboveground carbon sequestration. Canadian Journal of Forest Research. 41: 359-369.

Stiles, W., C.H. Borer, J. Stevenson, and K. Cabanillas. 2011. Feasibility analysis of forward osmosis for urine management in caves. Technical Report to the Cave Resource Office, Carlsbad Caverns National Park. Also submitted to the Conservation Section of the National Speleological Society.

Hawley, G.J., P.G. Schaberg, C. Eagar, and C.H. Borer. 2006. Calcium addition at the Hubbard Brook Experimental Forest reduced winter injury to red spruce in a high-injury year. Canadian Journal of Forest Research. 36: 2544-2549.

Borer, C.H., P.G. Schaberg, and D.H. DeHayes. 2005. Acidic mist reduces foliar membrane-associated calcium and impairs stomatal responsiveness in red spruce. Tree Physiology. 25: 673-680.

Schaberg, P.G., P.E. Hennon, D.V. D'Amore, G.J. Hawley and C.H. Borer. 2005. Seasonal differences in freezing tolerance of yellow-cedar and western hemlock trees at a site affected by yellow-cedar decline. Canadian Journal of Forest Research. 35: 2065-2070.

Borer, C.H., P.G. Schaberg, D.H. DeHayes, and G.J. Hawley. 2004. Accretion, partitioning and sequestration of calcium and aluminum in red spruce foliage: implications for tree health. Tree Physiology. 24: 929-939.

Borer, C.H. 2004. Calcium partitioning and depletion in the foliage of red spruce: Quantification, physiological consequences, and implications for forest health. Ph.D. Dissertation. University of Vermont, Rubenstein School of Environment and Natural Resources.

Borer, C.H., P.G. Schaberg, D.H. DeHayes, G.J. Hawley. 2001. Physiological implications of anthropogenic environmental calcium depletion. L'Arbre 2000 – The Tree. Isabelle Quentin, Publisher. Toronto, Ontario, Canada. 285-300.

Schaberg, P.G., D.H. DeHayes, G.J. Hawley, G.R. Strimbeck, J.R. Cumming, P.F. Murakami and C.H. Borer. 2000. Acid mist, soil Ca and Al alter the mineral nutrition and physiology of red spruce. Tree Physiology. 20: 73-85.

Hegman, W., D. Wang, and C. Borer. 1999. Estimation of Lake Champlain basinwide non-point source phosphorus export. Lake Champlain Basin Program Technical Report 31. 81 p.

Hughes, J.W., W.E. Jokela, D. Wang, and C. Borer. 1999. Determination and quantification of factors controlling pollutant delivery from agricultural land to streams in the Lake Champlain Basin. Report to the Lake Champlain Management Conference. Lake Champlain Basin Program Technical Report 35. 61 p.

Todd, J., C. Borer, C. Graziano, and J. Meyer. 1998. Biology at the South Burlington AEES Facility, Winter 1998. Quarterly Report to the Massachusetts Foundation for Excellence in Marine and Polymer Sciences. 17 p.

Borer, C.H., D.H. DeHayes, P. Schaberg, and J.R. Cumming. 1997. Relative quantification of membrane-associated calcium (mCa) in red spruce mesophyll cells. Trees: Structure and Function. 12: 21-26.

DeHayes, D.H., P.G. Schaberg, G.J. Hawley, C.H. Borer, J.R. Cumming, and G.R. Strimbeck. 1997. Physiological implications of seasonal variation in membrane-associated calcium in red spruce mesophyll cells. Tree Physiology. 17: 687-695.

Borer, C.H. 1994. Eastern white pine response to chronic ozone exposure: visible injury and growth. M.S. Thesis, University of Vermont. School of Natural Resources.

Endo, K., C.H. Borer, and Y. Tsujimoto. 1991. Modulation of LFA-1 surface antigen expression by activated H-ras oncogene in EBV-infected human B-lymphoblast cells. Oncogene. 6: 1391-1396.

PRESENTATIONS (underlined names denote Berry College student co-authors)

Borer, C.H., M.A. Dunn, M.G. Christensen, and K.M. Harnage. 2018. Calcium availability and cycling in understory shrubs. Presentation at Botany 2018. Joint annual meeting of the Botanical Society of America, and partner societies. Rochester, MN. July 21-25, 2018. Abstract published in proceedings.

McConnell, A. and C.H. Borer. 2018. Species identification of plant roots in caves via DNA extraction. Presented at: Berry College Student Scholarship Symposium, April 2018. Abstract published in proceedings.

Harnage, K. and C.H. Borer. 2018. Range of the Georgia *Alnus maritima*. Presented at: Berry College Student Scholarship Symposium, April 2018. Abstract published in proceedings.

Borer, C.H., J. Blake, B. Copeland, O. Leviton, T. Lusk, M. Sanders, and T. Wooley. 2017. Cave Ecology. Biology Department Seminar, October 31, 2017.

Borer, C.H. 2017. invited paper presentation, Georgia Plant Conservation Alliance, 6th Annual Fall Symposium, Sandy Springs, GA, October 19, 2017.

Borer, C.H. and M. Carver. 2017. The Georgia seaside alder: conservation challenges and opportunities. Invited talk and panel discussion in a special symposium, Getting everyone involved: Saving the seaside alder. Presented at Botany 2017, Joint annual meeting of the Botanical Society of America, and partner societies. Fort Worth, TX. June 24-28, 2017. Abstract published in proceedings.

Carver, M. and C.H. Borer. 2017. Conservation of a relict tree species, *Alnus maritima*, in northwest Georgia. Presented at: Berry College Student Scholarship Symposium, April 2017. Abstract published in proceedings.

Dunn, M. and C.H. Borer. 2017. Calcium sequestration in understory species. Presented at: Berry College Student Scholarship Symposium, April 2017. Abstract published in proceedings.

Valek, E. and C.H. Borer. 2017. Species identification of plant roots in caves in the SE U.S. using DNA analysis. Presented at: Berry College Student Scholarship Symposium, April 2017. Abstract published in proceedings.

Borer, C.H. 2016. Cave Ecology. Biology Department Seminar, November 1, 2016.

Millard, A.M., M.L. Carver, M.A. Dunn, J.L. Smith, and C.H. Borer. 2016. Evaluation of crystalline calcium in dried foliage samples. Presented at Botany 2016. Joint annual meeting of the Botanical Society of America, and partner societies. Savannah, GA. July 30-August 3, 2016. Abstract published in proceedings.

Borer, C.H. 2016. Cave Biology in TAG. Invited talk for the Pigeon Mountain Grotto of the National Speleological Society. June 3, 2016.

Dunn, M., M. Carver, J. Smith, A. Millard, and C.H. Borer. 2016. Health effects of acidic precipitation and aluminum in flowering dogwood and red oak. Presented at: Berry College Student Scholarship Symposium, April 2016. Abstract published in proceedings.

Smith, J., A. Millard, M. Carver, and M. Dunn, and C.H. Borer. 2016. Evaluation of a proposed method to measure crystalline calcium in preserved plant foliage. Presented at: Berry College Student Scholarship Symposium, April 2016. Abstract published in proceedings.

Borer, C.H. 2016. Science, fruit and 通信挑战: A visit to southwestern China. Berry College Biology Department Seminar. March 22, 2016.

Borer, C.H. 2016. Cave life of the TAG Region. Invited talk for the Clock Tower Grotto of the National Speleological Society. March 17, 2016.

Borer, C.H. 2016. Some secret superpowers of cave life. Invited talk for the Southeastern Cave Conservancy Member Appreciation Day. February 27, 2016.

Borer, C.H. 2016. Afternoon Odyssey: Dr. Cathy Borer in China. Berry College International Programs seminar. February 2, 2016.

Borer, C.H. 2015. Cave Ecology. Biology Department Seminar, October 27, 2015.

Borer, C.H. 2015. Quantification of calcium partitioning and sequestration in plant foliage sheds new light on essential calcium physiology. Invited seminar, Guangxi University, Nanning, Guangxi Province, China. June 26, 2015. Abstract published for research team.

Borer, C.H. 2015. Foliar calcium partitioning reveals fundamental calcium-dependent processes. Invited seminar for research series at Xishuangbanna Tropical Botanical Garden, Menglun township, Mengla County, Xishuangbanna Autonomous Prefecture, Yunnan Province, China. June 16, 2015. Abstract published for scientific staff.

Moore, S. and C. Borer. 2015. Cave conservation: Evaluation of activated carbon and zeolite to mitigate urine deposition during extended cave trips. Presented at: Berry College Student Scholarship Symposium, April 2015. Abstract published in proceedings.

Muhelfeld, R., K. Watson, S. Elston, C. Sinkula, and C. Borer. 2015. Physiological response of flowering dogwood and red oak to foliar acidification and soil aluminum. Presented at: Berry College Student Scholarship Symposium, April 2015. Abstract published in proceedings.

Borer, C.H. 2014. Cave Ecology. Biology Department Seminar, November 4, 2014.

Borer, C.H., A.B. Cahoon, J. Miller, and T. Tate. 2014. Documentation of foliar surface features for calcium tolerance of *Poliomintha incana*, from White Sands National Monument, an extremely high-calcium site. Presented at Botany 2014. Joint annual meeting of the Botanical Society of America, and partner societies. Boise, ID. July 26-31, 2014. Abstract published in proceedings.

Tate, T., J. Keiler, K. Salazar, R. Muehlfeld, and C. Borer. 2014. Sensitivity of flowering dogwoods and red oaks to aluminum toxicity and foliar acidification. Presented at: Berry College Student Scholarship Symposium, April 2014. Abstract published in proceedings.

Castro, M., C.H. Borer, S.G. Sapp, and K. Gamboa Salazar. 2013. Do plants resorb labile forms of foliar calcium prior to leaf abscission? Presented at Botany 2013. Joint annual meeting of the Botanical Society of America, and partner societies. New Orleans, LA. July 27-31, 2013. Abstract published in proceedings.

Castro, M., S.G. Sapp, K. Daniel and C. Borer. 2013. Calcium resorption and leaf color analysis in *Cornus florida* during leaf senescence. Presented at: Berry College Student Scholarship Symposium, April 2013. Abstract published in proceedings.

Patel, V., and C. Borer. 2013. Evaluation of methods to reduce ecological impacts of urine deposition during extended cave exploration. Presented at: Berry College Student Scholarship Symposium, April 2013. Abstract published in proceedings.

Borer, C.H. 2013. Plant Dances: An exploration of sensitivity and responsiveness in the plant kingdom. Invited seminar, Biology Department. Rivier University. January 25, 2013.

Borer, C.H., M. Hamby, and L. Hutchinson. 2012. Calcium partitioning and sequestration in foliage from plants at White Sands National Monument: Strategies for calcium tolerance. Invited presentation and workshop participation, White Sands Science Symposium. Las Cruces, NM. June 7-8, 2012.

Borer, C.H. 2012. The economics of foliar calcium: spending money, savings accounts, and long-term investment. Invited seminar, Biology Department. Middle Tennessee State University. April 3, 2012.

Borer, C.H., R. Bailey, B. Bannister, A. Beavers, M. Castro, M. Crider, T. Kim, M. Leroux, C. Parsons, M. Royal, S. Sapp, C. Teagle. 2012. Biology Seminar: *Plant Dances*. Plant Physiology time-lapse video project presentations.

Castro, M., S.G. Sapp, C.K. Daniel, and C.H. Borer. 2012 Calcium resorption in *Cornus florida* during leaf senescence. Presented at: Berry College Student Scholarship Symposium, April 2012. Abstract published in proceedings.

Borer, C.H. and S.G. Sapp. 2011. Phenology of foliar calcium accretion and partitioning in flowering dogwood (*Cornus florida* L.). Presented at Botany 2011. Joint annual meeting of the Botanical Society of America, and partner societies. Saint Louis, MO. July 8-13, 2011. Abstract published in proceedings.

Mooney, A. and C.H. Borer. 2011. The influence of leaf litter composition on total body calcium of earthworms (*Lumbricus terrestris* L.). Presented at: Association of Southeastern Biologists, 2011 annual meeting. Southeastern Biology 58(3): 359-360.

Sapp, S.G., and C.H. Borer. 2011. Phenology of foliar calcium accretion and sequestration in *Cornus florida* L. Presented at: Association of Southeastern Biologists, 2011 annual meeting. Southeastern Biology 58(3): 358-359.

Sapp, S.G., and C.H. Borer. 2011. Analysis of seasonal variation of calcium in Flowering Dogwood foliage. Presented at: Berry College Student Scholarship Symposium, April 2011. Abstract published in proceedings.

Stevenson, J., B. Nelson, and C.H. Borer. 2011. Enhancing Opportunities for Environmental Education in Rome, Georgia: Restoration of a Public Demonstration Wetland in Ridge Ferry Park. Presented at: Berry College Student Scholarship Symposium, April 2011. Abstract published in proceedings. Poster has been displayed at Rome's ECO Center.

Borer, C.H. and C.E. Scott. 2010. Calcium partitioning and sequestration in plant foliage from White Sands National Monument, an extremely high-calcium site. Presented at Botany 2010. Joint annual meeting of the Botanical Society of America, and partner societies. Providence, RI. July 31 – August 4, 2010. Abstract published in proceedings.

Head, L., A. Mooney, and C.H. Borer. 2010. *Cornus florida*'s sequestration of labile calcium and its role in calcium cycling. Presented at Botany 2010. Joint annual meeting of the Botanical Society of America, and partner societies. Providence, RI. July 31 – August 4, 2010. Abstract published in proceedings.

Stevenson, J., K. Cabanillas, and C.H. Borer. 2010. Assessment of urine filtration via forward osmosis for cave resource protection. Presented at: Berry College Student Scholarship Symposium, April 2010. Abstract published in proceedings.

Head, L. and C.H. Borer. 2010 Calcium sequestration and cycling in *Cornus florida*. Presented at: Berry College Student Scholarship Symposium, April 2010. Abstract published in proceedings.

Mooney, A. and C.H. Borer. 2010. Forest health and soil-available calcium: Dogwood connections. Presented at: Berry College Student Scholarship Symposium, April 2010. Abstract published in proceedings.

Borer, C.H., A. Acree, J. Culberson, D. Highsmith, A. Kinsey, L. LaMay, R. Leslie, A. Mooney, C. Parsons, J. Presley, S. Sapp, A. Summerlin. 2010. Biology Seminar: Plant Physiology time lapse video project presentations, and presentation of greenhouse website.

Borer, C.H., L. Head and R. Leslie. 2009. Foliar calcium partitioning in *Cornus florida*: A role in ecological calcium cycling. Presented at: Ecological Society of America, 2009 annual meeting. Albuquerque, NM. August 2 – 7, 2009. Abstract published in proceedings.

Head, L., C. Borer, and R. Leslie. 2009. Foliar calcium partitioning and its role in calcium cycling by *Cornus florida*. Presented at: Association of Southeastern Biologists, 2009 annual meeting. Abstract published in proceedings.

Head, L., C. Borer, and R. Leslie. 2009. Foliar calcium partitioning and its role in calcium cycling by *Cornus florida*. Presented at: Berry College Student Scholarship Symposium, April 2009. Abstract published in proceedings.

Mooney, A., and C. Borer. 2009. Forest health and calcium availability within the soil: Dogwood dependence. Poster presented at: Berry College Student Scholarship Symposium, April 2009. Abstract published in proceedings.

Borer, C.H., L. Head and R. Leslie. 2008. Calcium partitioning and physiological availability in the foliage of flowering dogwood. Presented at: Botany 2008 – Botany Without Borders. Joint annual meeting of the Botanical Society of America, and partner societies. Vancouver, BC. July 26 – 30 2008. Abstract published in proceedings.

Head, L., R. Leslie and C. Borer. 2008. Forest health, dogwoods, and the calcium connection. Poster presented at Berry College Student Scholarship Symposium. April 2008. Abstract published in proceedings.

Borer, C.H. 2006. Are we killing the messenger? Red spruce as a model for the importance of calcium in forest health. Invited seminar, Biology Department. Berry College. January 10, 2006.

Borer, C.H., P.G. Schaberg and D.H. DeHayes. 2005. Redefining foliar calcium deficiency and vulnerability. Presented at: Ecological Society of America 90th annual meeting, Montreal, QC. August 7-12, 2005. Abstract published in proceedings.

Borer, C.H. and P.G. Schaberg. 2005. Acid rain and tree health: Lessons learned from red spruce and other tree species. Invited presentation for Human Health and the Environment course, UVM. April 21, 2005.

Borer, C.H. 2005. Calcium in red spruce foliage: Physiology, anthropogenic depletion and implications for forest health. Invited seminar, Biology Program. Western State College of Colorado. March 8, 2005.

Borer, C.H. 2004. Statistical analyses in scientific research. Invited presentation for Basic Mathematics course (Math 18), UVM. September 29, 2004.

Hawley, G.J., P.G. Schaberg, D.H. DeHayes, C.H. Borer. 2004. Calcium addition to a watershed at Hubbard Brook LTER reduces red spruce winter injury. Ecological Society of America 89th annual meeting, Portland, OR, August 2-6, 2004. Abstract published in proceedings.

Schaberg, P.G., P.E. Hennon, D.V. D'Amore, G.J. Hawley, C.H. Borer. 2004. Is freezing injury a contributor to yellow-cedar decline? Ecological Society of America 89th annual meeting, Portland, OR, August 2-6, 2004. Abstract published in proceedings.

Borer, C.H., P.G. Schaberg, D.H. DeHayes, and G.J. Hawley. 2003. Differential biochemical partitioning and physiological availability of calcium and aluminum in red spruce foliage. Presented at: The Ecological Society of America, 88th Annual meeting, Savannah, GA, August 3-8, 2003. Abstract published in proceedings.

Borer, C.H. 2003. Ethics and exploration at the edge: Cave conservation and lessons learned from Lechuguilla Cave. Invited presentation for the School of Natural Resources, UVM, Conservation Biology Seminar Series. January 30, 2003.

Borer, C.H., P.G. Schaberg, D.H. DeHayes, and G.J. Hawley. 2002. Environmental calcium availability: Influence on physiologically important foliar calcium and plant response to the environment. Presented at: The 17th North American Forest Biology Workshop, Washington State University, Pullman, WA, July 15-19, 2002. Abstract published in proceedings.

Borer, C.H., P.G. Schaberg, D.H. DeHayes, and G.J. Hawley, 2002. Acid rain impacts foliar membrane-associated calcium and responsiveness of red spruce to water stress. Presented at: Northeastern Section Meeting, American Society of Plant Biologists, Wellesley College, Wellesley, MA, May 3-4, 2002. Abstract published in proceedings.

Borer, C., P. Newman, C. Ginger, J. Shane, M. Watzin. 2002. Teaching to learn and learning to teach: A case study of multi-level, interdisciplinary education in Natural Resources.

Presented at: The Fourth Biennial Conference on University Education in Natural Resources. North Carolina State University, Raleigh, NC, March 14-17, 2002. Abstract in proceedings.

Borer, C., P. Newman, C. CichoskiKelly. 2002. Collaborative, interactive, interdisciplinary teaching and learning. NR105: A new paradigm for the Ph.D. student experience in SNR. Presented at: School of Natural Resources, UVM faculty retreat. January 11, 2002.

Borer, C.H. 2001. Forest health implications of calcium perturbations in trees. Presented at the US EPA STAR Fellows Conference, Silver Spring, MD. July 2001. Abstract published in proceedings.

Borer, C.H. 2001. Technique development and temporal patterns of membrane-associated calcium in red spruce mesophyll cells. Invited presentation and discussion for MS-level Research Methods course, School of Natural Resources, UVM. February 27, 2001.

Schaberg, P.G., P.F. Murakami, B.E. Lazarus, D.H. DeHayes, G.J. Hawley, C.H. Borer. 2001. Membrane-associated calcium: a source of signal calcium in woody plants? Presented at: Plant Biology 2001: a joint meeting of the American Society of Plant Biologists and the Canadian Society of Plant Biologists, Providence, RI, 21-25 July, 2001. Abstract published in proceedings.

Borer, C.H., P.G. Schaberg, D.H. DeHayes, G.J. Hawley. 2000. Physiological implications of anthropogenic environmental calcium depletion. Presented at: The Fourth International Symposium on the Tree, Montreal, Quebec, Canada. August 20-26, 2000.

Borer, C.H. and D.H. DeHayes. 2000. What am I measuring, how does it relate to what I want to know, and what are the practical implications? Invited presentation for the School of Natural Resources, UVM, Brown Bag Seminar Series. April 5, 2000.

Borer, C.H. 1999. Red spruce: canary or dodo? Presentation for the School of Natural Resources, UVM, Graduate Student Research Symposium. October 15, 1999.

Borer, C., J. Hughes, W. Jokela, and D. Wang. 1998. Phosphorus dynamics in vegetated buffer areas between cornfields and streams in the Lake Champlain Basin. Presented at: Lake Champlain and its Basin: A Summary after Six Years of Research. May 26-28, 1998.

Hawley, G.J., Schaberg, P.G., DeHayes, D.H., Cumming, J.R., Strimbeck, G.R., Borer, C.H., Cali, P.F. 1995. A mechanism for acid mist-induced freezing stress of red spruce. 75th Annual Meeting of the New England Society of American Foresters. Burlington, VT. March 21-23, 1995. Abstract published in proceedings.

Borer, C., D. Wang, D. DeHayes, J. Cumming, and G. Hawley. 1992. Ozone sensitivity of eastern white pine: Mediated by genetic diversity? Presented at the USDA Forest Service symposium: "The Effects of Air Pollution on Terrestrial and Aquatic Ecosystems in New England and New York." October 19-21, 1992.

SERVICE

Coordinator, Environmental Science Program, Berry College, 2013 – present. Coordination activities for the program, which has nearly 70 majors in 5 concentrations, include the responsibilities of a department chair, with additional responsibilities of coordinating students and course requirements from a wide range of MNS departments, and from other Schools. Ad-Hoc Committee: off-campus, domestic programs. Berry College. Spring 2016 – present.

Invited by the US Fish and Wildlife Service (USFWS) to serve as a peer reviewer of a Species Status Assessment (SSA) for the Seaside Alder, (an extensive 163-page document, documenting characteristics and needs of the species, the current condition of the species and threats to its survival, and evaluating possible future scenarios for the species). I provided substantial feedback as well as additional information and pictures that will be used in the revised SSA.

Elected member of National Cave Rescue Commission Education Committee. This committee creates, evaluates, and adjusts curriculum, course content, presentation strategies, course materials, and exams for all NCRC courses. The committee evaluates instructor candidates and oversees periodic reevaluation of all instructors. An important current project is creation and development of a nationally-recognized certification program for cave rescuers.

Emerging Female Scientist, Editorial Review Board member, 2018 – present. *Emerging Female Scientist* is the first electronic, peer-reviewed, open access scientific journal promoting and publishing articles by female middle and high school students. The journal will publish reports of original research, interviews with well-known female scientists, updates on current STEM activities nationwide, and summaries of noteworthy policy issues.

Council to Chief Scientist of Southeastern Cave Conservancy; regarding biology and conservation, including peer review of scientific research permit applications, 2016 – present.

Endowed Lecture Committee member, 2017-2019. Faculty Assembly elected representative, Berry College.

Health and Wellness committee, 2016 – 2018. Faculty Assembly elected representative, Berry College.

Cultural Events committee member, 2015 – 2017. MNS elected representative, Berry College.

School of Mathematical and Natural Sciences, course scheduling committee, EVS representative. 2014 – present.

Chair, Environmental Science Faculty Search Committee, Berry College, fall 2013. This successful search was for the first faculty member whose primary appointment is associated with the Environmental Science Program at Berry College.

Educational Land Management (ELM) committee member, 2013 – 2016. Oversight and coordination of land use activities on the 26,000 acre campus of Berry College.

Center for Teaching Excellence Advisory Committee member, MNS elected representative, Berry College 2013 – 2015.

Interfaith Council, Faculty Assembly elected representative, Berry College 2013 – 2015.

Georgia Campus Sustainability Network Annual Conference, Berry College representative. Macon, GA, September 20, 2013.

PlantingScience mentor scientist, 2011, 2013, 2015, 2016, 2017. Electronic mentorship of student teams designing, completing, and reporting their self-designed plant-based research projects. This international program is sponsored by the National Science Foundation, and includes 14 partner scientific societies, such as the Botanical Society of America and the Ecological Society of America. Its purpose is to foster scientific literacy by integrating student-designed plant-specific research into the curriculum of high schools and middle schools, with electronic mentorship from professional scientists.

Representative/contact for Environmental Protection Agency student funding opportunities, National and International Scholarships and Fellowships, Berry College 2011-present.

Mathematical and Natural Sciences (MNS) Development of Undergraduate Research Committee, Berry College (Biology representative) 2010 – 2013.

Ad-Hoc Committee on Undeclared Students (MNS rep.), Berry College, Fall 2011 – present. Invited Reviewer, United States Department of Energy, Office of Science Graduate Fellowship Program, spring 2012. Evaluated graduate fellowship applications from high quality graduate students at institutions throughout the United States.

Invited guest scientist, Georgia School for the Deaf. January 7, 2014; January 5, 2012. Taught a full day of classes in Biology and Environmental Science.

Planning Council (MNS, elected representative), Berry College, Fall 2010 – Spring 2012.

Berry representative – Council on Undergraduate Research (CUR) Dialogs. Washington, DC. Feb 23-25, 2012 (Registration and travel was funded by Provost's Office). The conference was designed to inform and encourage faculty at PUIs to apply for federal research funding.

Berry College Scholarship Day volunteer. February 11, 2012.

Reviewer for two book chapters in Biological Science, 5th Edition, Pearson: Chapter 37, Plant Form and Function; Chapter 38, Water and Sugar Transport in Plants. Spring 2011.

Mentor, Berry Environmental Living and Learning (BELL) House, 2011 – 2012.

Honors thesis advisory committee member for Berry College students:
John Patten Moss, Environmental Science, spring 2018 – present.
Matt Summerlin, Chemistry, spring 2011 – spring 2012.
Katie Wallace, Communications, spring 2011 – fall 2011.
Josh Jones, Chemistry, Berry College, fall 2010 – spring 2011.
Lorin Letcher, Anthropology, Berry College, fall 2009 – fall 2010.
Stephanie Tucker, Chemistry, Berry College, fall 2007 – spring 2009.

Berry College Faculty Awards Selection committee, Spring 2011.

Volunteer representing the Southeastern Cave Conservancy. Bat Blitz Family Education Night, Fort Mountain State Park, Chattsworth, GA. July 25, 2010.

Invited Reviewer, United States Department of Energy, Office of Science Graduate Fellowship Program, spring 2010. Evaluated applications in the field of Ecology.

Writing Across the Curriculum committee (MNS, elected representative), Berry College, 2008 – 2010. Committee co-chair, 2009-2010.

Faculty search committee (MNS representative), Director of Memorial Library, Berry College, fall 2008. The new Library Director began work at Berry College during the spring of 2009.

Chair, ad-hoc committee to assess the possible addition of a major or program in Natural Resource Management at Berry College (MNS-based committee), 2007 – 2008.

Academic advisor for approximately 20 students, Berry College, summer 2007 – present. Advised during various summer SOAR sessions. Taught BCC100, fall 2007.

Oversight of Biology department's teaching greenhouse, Berry College, fall 2006 – present. Implemented informational website, spring 2010.

Faculty advisor, Society of Outdoor Life and Exploration (SOLE), Berry College, fall 2006 – present. Host of Berry's annual event of the award-winning Telluride Mountainfilm Festival tour, 2009 - present. (Outstanding Advisor award 2011).

Faculty advisor, Students Against Violating the Earth (SAVE), Berry College, fall 2007 – present. (Outstanding Advisor award 2011). SAVE was honored as a "Heart of Berry" organization, 2011.

Faculty advisement for student "green initiatives" on campus, ongoing meetings organized by D. Heida (Vice President, Student Affairs). Fall 2008 – Spring 2012.

Microbe and substrate sample collection from Lechuguilla Cave, NM, in support of research on extremophile species, as a volunteer for the National Park Service and the University of New Mexico, 2004, 2005, 2006, 2008, 2009.

Invited participant, Re-envisioning the Ph.D. in the Graduate College, UVM, 2002.

Undergraduate core curriculum development and website development, School of Natural Resources, UVM, 2000 - 2002.

Faculty Search Committee, Patrick Chair of Watershed Science and Planning, UVM, 2000 - 2001.

Ph.D. student seminar series. Conceptualized, developed, coordinated, and participated in discussion series on faculty development, UVM, spring 2000.

Manuscript Review:

Journal of Arid Environments
Functional Plant Biology
Tree Physiology (2006 Editorial Review Board)
Scandinavian Journal of Forest Research
Emerging Female Scientist (Editorial Review Board, 2018 – present)

Professional Memberships:

American Society of Plant Biologists
Association of Southeastern Biologists
Botanical Society of America
- Ecological Section
  - (judged student presentations, 2011, 2013, 2018)
- Teaching Section
- Southeastern Section
- Physiological Section
  - (judged student presentations, 2008, 2010, 2011, 2013, 2014, 2016)

Council on Undergraduate Research
- Berry representative and active participant at Dialogs, Feb. 2012

Ecological Society of America
- Physiological Ecology Section
- Teaching Section

National Cave Rescue Commission, Education Committee member, elected Feb. 2018.
National Speleological Society
- Chattanooga Grotto
- Clock Tower Grotto
  - (**Chair**, 2008, 2009, 2013, 2014, 2015; **Vice-chair** 2010, 2011, 2012)
- Dogwood City Grotto
- Pigeon Mountain Grotto

Phi Kappa Phi, full member; inducted 2013
Sigma Xi, full member; inducted 2006
- **Secretary** for Berry College chapter 2009-2010
- **President** for Berry College chapter 2008-2009
- **Vice-president** for Berry College chapter 2007-2008

Southeastern Cave Conservancy, sustaining member; council to Chief Scientist
Institutional Review Board
Collaborative Institutional Training Initiative trained.
Institutional Animal Care and Use Committee trained.

Wilderness First Responder (WFR) certification, Wilderness Medicine Institute (WMI) of the National Outdoor Leadership School (NOLS). Nationally-recognized certification in WFR, May 2013. Recertified April 2015, March 2017, valid through March 2019.
CPR for the Professional Rescuer (American Heart Association) certification – valid through January 2019.
National Cave Rescue Commission (NCRC). Successfully completed:
Level 1, intensive week-long cave rescue training seminar, May 2010,
Level 2, intensive week-long cave rescue training seminar, May 2012,
Level 3, intensive week-long cave rescue training seminar, May 2016.
Small Party Assisted Rescue, 4-day intensive training seminar, November 2017.
Team Operations and Field Exercises, intensive week-long cave rescue training seminar, May 2018.
Rope Technician, Level I, May 2014.
FEMA – Emergency Management Institute:
IS-00100.b – Introduction to Incident Command System (ICS-100) 0.3CEU
IS-00200.b – ICS for Single Resources and Initial Action Incident 0.3CEU
IS-00700.a – National Incident Management System (NIMS), an Introduction 0.3CEU

Chattanooga – Hamilton County Rescue Service, Cave/Cliff/Technical Unit member 2013 - present. Ongoing monthly training and additional certifications associated with this volunteer service work. Details are available upon request.