Curriculum Vitae
William D. Bowman

Department of Ecology & Evolutionary Biology
Campus Box 334
University of Colorado
Boulder, CO 80309-0334
(303) 492-2557

Mountain Research Station and
Institute of Arctic and Alpine Research
Campus Box 450
University of Colorado
Boulder, CO 80309-0450
(303) 492-8842

email: william.bowman@colorado.edu

Education: B.A. University of Colorado, Environmental Biology, 1981
M.S. San Diego State University, Ecology, 1984
Ph.D. Duke University, Botany, 1987

Positions: 1991 to present: Director, Mountain Research Station, Fellow, Institute of Arctic and Alpine Research
2003 to present, Professor, Ecology and Evolutionary Biology
1995 to 2003, Associate Professor, Environmental, Population, and Organismic Biology
1989 to 1995, Assistant Professor, Environmental, Population, and Organismic Biology
1988, Postdoctoral Research Associate, Duke University
1988, Visiting Fellow, the Australian National University
1986-1987, Research Associate, Duke University

Research Interests: Plant ecology, biogeochemistry, impacts of pollution, alpine ecology

Fellowships and Awards: The Perry Prize, for outstanding Ph.D. dissertation Duke University; visiting fellowship, the Australian National University; University of Colorado Junior Faculty Development Award; Boulder Faculty Assembly, Excellence in Research Award 2015; Outstanding Undergraduate Research Mentor award sponsored by Special Undergraduate Enrichment Programs, 2015

Publications

* undergraduate student author, ** graduate student author

Journal Articles:

Clark, C.M., Simkin, S.M., E.B. Allen, W.D. Bowman, J. Belnap, M.L. Brooks, S.L. Collins, L.H. Geiser, F.S. Gilliam, S.E. Jovan, L.H. Pardo, B.K. Schulz, C.J. Stevens, K.N. Suding, H.L. Throop, and D.M. Waller. 2019. Potential vulnerability of 348 herbaceous species to atmospheric deposition of nitrogen and sulfur in the U.S. Nature Plants doi.org/10.1038/s41477-019-0442-8

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Komatsu, K.J., M. L. Avolio, N. P. Lemoine, F. Isbell, E. Grman, G. R. Houseman, S. E. Koerner, D. S. Johnson, K. R. Wilcox, J. M. Alatalo, J. P. Anderson, R. Aerts, S. G. Baer, A. H. Baldwin, J. Bates, C. Beierkuhnlein, R. T. Belote, J. Blair, J. M. G. Bloor, P. J. Bohlen, E. W. Bork, E. H. Boughton, W. D. Bowman, A. J. Britton, J. F. Cahill Jr., E. Chaneton, N. R. Chiariello, J. Cheng, S. L. Collins, J. H. C. Cornelissen, G. Du, A. Eskelinen, J. Firn, B. Foster, L. Gough, K. Gross, L. M. Hallett, X. Han, H. Harmens, M. J. Hovenden, A. Jagerbrand, A. Jentsch, C. Kern, K. Klanderud, A. K. Knapp, J. Kreyling, W. Li, Y. Luo, R. L. McCulley, J. R. McLaren, J. P. Megonigal, J. W. Morgan, V. Onipchenko, S. C. Pennings, J. S. Prevéy, J.i N. Price, P. B. Reich, C. H. Robinson, F. L. Russell, O. E. Sala, E. W. Seabloom, M. D. Smith, N. A. Soudzilovskaia, L. Souza, K. Suding, K. B. Suttle, T. Svejcar, D. Tilman, P. Tognetti, R. Turkington, S. White, Z. Xu, L. Yahdjian, Q. Yu, P. Zhang, and Y. Zhang. 2019. Global change effects on plant communities are magnified by time and the number of global change factors imposed. Proceedings of the National Academy of Sciences doi.org/10.1073/pnas.1819027116

Bowman, W.D., A. Ayad*, C.P. Bueno de Mesquita**, N. Fierer, T.S. Potter**, and S. Sternagel*. 2018. Limited ecosystem recovery from simulated chronic nitrogen deposition. Ecological Applications 28: 1762-1772.

Langley, J.A., S.K. Chapman, M. Avolio, W.D. Bowman, D.S. Johnson, K.J. La Pierre, F. Isbell, K.R. Wilcox, B.L. Foster, M.J. Hovenden, A.K. Knapp, S. Koerner, C. Lortie, J.P. Megonigal, P. Newton, P.B. Reich, M.D. Smith, B. Suttle, and D. Tilman. 2018. Ambient changes exceed treatment effects on plant species abundance in global change experiments. Global Change Biology DOI: 10.1111/gcb.14442

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communities. Journal of Vegetation Science 29: 25-33.

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Wilcox, K, Tredennick, A., Koerner, S., Grman, E., Hallett, L., Avolio, M., La Pierre, K., Houseman, T., Isbell, F., Johnson, A., Alatalo, J., Baldwin, A., Bork, E., Boughton, E., Bowman, W.D., Britton, A., Cahill, J., Collins, S., Du, G., Eskelinen, A., Gough, L., Jentsch, A., Kern, C., Klanderud, K., Knapp, A., Kreyling, J., Luo, Y., McLaren, J., Megonigal, P., Onipchenko, V., Prevéy, J., Price, J., Robinson, C., Sala, O., Smith, M., Soudzilovskaia, N., Souza, L., Tilman, D., White, S., Xu, Z., Yahdjian , L., Yu, Qiang, Z., Pengfei, Zhang, Y. 2017. Asynchrony among local communities stabilizes ecosystem function of metacommunities. Ecology Letters 20: 1534-1545. (*top 20 of the journal's most cited papers*)

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Hinkley, E.S., S.P. Anderson, J.S. Baron, P.D. Blanken, G.B. Bonan, W.D. Bowman, S.C. Elmendorf, N.Fierer, A.M. Fox, K.J. Goodman, K.D. Jones, D.L. Lambardozzi, C.K. Lunch, J.C. Neff, M.D. SanClements, K.N. Suding, W.R. Wieder. 2016. Optimizing available network resources to address questions in environmental biogeochemistry. BioScience 66: 317-326.

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Miller, A.E.** and W.D. Bowman. 2002. Variation in ^{15}N natural abundance and nitrogen uptake traits among co-occurring alpine species: do species partition by nitrogen form?. Oecologia 130: 609-616.

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Bowman, W.D., A. Keller*, and M. Nelson. 1999. Altitudinal variation in leaf gas exchange, nitrogen and phosphorus concentrations and leaf mass per area in populations of *Frasera speciosa*. Arctic, Antarctic, and Alpine Research 31: 191-195.

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Book Reviews

For Journals:

Bowman, W.D. 2003. Taking a broad view of plant ecology: *The ecology of plants*. Ecology 84: 1073.

Bowman, W.D. 1997. *Mountains and plains: The ecology of Wyoming landscapes*. Ecology 78: 1610-1611

Bowman, W.D. 1992. *Ecological Responses to Environmental Stresses*. Rozema, J. and J.A.C. Verleij (eds.). Kluwer Academic Publishers, Dordrecht. Journal of Vegetation Science

Bowman, W.D. 1990. *Plant Physiological Ecology- Field Methods and Instrumentation*. Pearcy, R.W., Ehleringer J., Mooney, H.A., and Rundel, P.W. (eds.). Chapman and Hall, London. Journal of Vegetation Science

Book Reviews for Publishers:

Smith, R.L. 1996. Ecology and Field Biology, fifth edition. Harper and Row, New York.

Barbour, M.G., Burk, J.H., and Pitts, W.D. 1987. Terrestrial Plant Ecology, 2nd edition, Benjamin/ Cummings, Menlo Park, CA (evaluation for preparation of 3rd edition)

Scientific and Professional Societies

American Institute of Biological Sciences
Ecological Society of America
Organization of Biological Field Stations

Invited Presentations, Conferences Attended, Published Abstracts, Grey Literature

Potter, T. and W.D. Bowman. Exploring the roles of plant relatedness and environmental change in predicting rhizosphere microbial community structure. Contributed talk, Ecological Society of America Meeting, Portland, OR 2017.

Churchill, A.C., J.B. Grinath, A. Beers, and W.D. Bowman. Drivers of spatial heterogeneity in nitrogen processing among three alpine plant communities in the Rocky Mountains. Contributed talk, Ecological Society of America Meeting, Portland, OR 2017.

Simkin, S.M., C.M. Clark, W.D. Bowman, E.B. Allen, and C.J. Stevens. Herbaceous plant species diversity relationships with nitrogen deposition: Soil and climate contingencies across the USA. Invited symposium, Ecological Society of America Meeting, Baltimore, MD 2015

Churchill, A.C. and W.D. Bowman. Differences in ecological thresholds to nitrogen deposition among Rocky Mountain alpine meadow ecosystems. Contributed poster, Ecological Society of America Meeting, Baltimore, MD 2015.

Responses of herbaceous vegetation diversity to atmospheric nitrogen deposition. co-workshop organizer, sponsored by the USGS Powell Center, January 2013, 2014.

Samuel M. Simkin , Edith B. Allen , Jayne Belnap , Southwest Biological Science Center, William D. Bowman , Matthew L. Brooks , Christopher M. Clark. 2014. A national synthesis of atmospheric nitrogen deposition relationships with herbaceous plant diversity. Ecological Society of America Meeting, Sacramento, CA

Churchill, A.C. and W.D. Bowman. 2014. Alpine moist meadow response to regional gradients of nitrogen deposition in the Rocky Mountains. Ecological Society of America Meeting, Sacramento, CA

Guild of Rocky Mountain Ecologists and Evolutionary Biologists, Pingree Park, Colorado State University, September 2014.

Convergence/ divergence in plant communities in response to resource manipulations. NSF LTER synthesis workshop, Ft Collins, 7/24-26/13

Bowman W.D. Factors controlling alpine plant community composition: biotic interactions and plant-soil feedback. invited talk, University of Wyoming Zoology Department, March 2013.

Bowman, WD. Song and symphonic metamorphosis of the alpine: Change is in the air. Boulder County Nature Association, tribute to Joyce Gellhorn, March 2013. (outreach activity)

Harris, R. and W.D. Bowman. Effects of lodgepole pine death due to mountain pine beetle and forestry management on understory plant communities. contributed paper, 2012 ESA meeting, Portland, OR

Bowman, W.D., J.S. Baron, L. Geiser, M.E. Fenn, and E.A. Lilleskov. 2011. Northwestern forested mountains [Chapter 8]. In: L.H. Pardo, M.J. Robin-Abbott, and C.T. Driscoll (eds.). Assessment of N deposition effects and empirical critical loads of N for ecoregions of the United States. General Technical Report NRS-80. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 75-88 p.

Pardo, L.H., L.H. Geiser, M.E. Fenn, C.T. Driscoll, C.L. Goodale, E.B. Allen, J.S. Baron, R. Bobbink, W.D. Bowman, C. Clark, B. Emmett, F.S. Gilliam, T. Greaver, S.J. Hall, E.A. Lilleskov, L. Liu, and J.A. Lynch. 2011. Synthesis [Chapter 19]. In: L.H. Pardo, M.J. Robin-Abbott, and C.T. Driscoll (eds.). Assessment of N deposition effects and empirical critical loads of N for ecoregions of the United States. General Technical Report NRS-80. Newtown Square, PA: Department of Agriculture, Forest Service, Northern Research Station. 229-284 p.

Interactive effect of nitrogen depositon and climate change on terrestrial biodiversity. International Nitrogen Initiative Workshop, funded through the USGS Powell Center, July 2011

Alpine research on Niwot Ridge, CO. NSF sponsored workshop on alpine research in the northeastern U.S. April 1-2, 2011 White Mountains, NH

Nitrogen critical loads for the southern Rocky Mountains. Workshop on Greater Ecosystem Air Quality issues, April 5, 2011, Jackson Hole, WY

Bowman, WD. Why too much of a good thing can be bad: Ecosystem responses to atmospheric nitrogen pollution. invited departmental seminar, April 2010, University of Denver

Bowman, WD. 2010. Impacts of nitrogen deposition on alpine ecosystem structure and function. 95th annual ESA Meeting, Pittsburgh, PA

Bowman, WD. 2010. Nitrogen effects on biodiversity. invited presentation, International Nitrogen Initiative workshop, May, Boulder, CO.

Bowman, WD. 2010. Effects of simulated nitrogen deposition in Rocky Mountain National Park. Biennial Research Conference, Rocky Mountain National Park, Estes Park, CO

Pardo, L.H. and many others (including W.D. Bowman). 2010. Effects of nitrogen deposition and empirical critical loads for nitrogen for ecoregions of the United States. 95th annual ESA Meeting, Pittsburgh, PA

Bowman, WD, L. Halada, J. Hreško, C. C. Cleveland, J. S. Baron, and J. Murgel. 2009. How much is too much? N critical loads and eutrophication and acidification in oligotrophic ecosystems. SCOPE, International Nitrogen Initiative Workshop on Biodiversity, Edinburgh, Scotland.

Meier, CM and WD Bowman. 2009. Predicting non-additive effects of species diversity on decomposition using functional traits based on litter chemistry Ecological Society of America Meeting, Albuquerque, NM

Bowman, W.D. 2008. Species make a difference – Biotic interactions, community composition, and the functioning of alpine ecosystems. invited talk, University of Lausanne, Switzerland

Bowman, W.D. 2007. Nitrogen deposition effects on vegetation and soils in alpine ecosystems. invited presentation, National Atmospheric Deposition Program, annual meeting, Boulder, CO.

Ashton, I.W., A.E. Miller, W.D. Bowman, and K.N. Suding. 2007. Competition, nitrogen partitioning, and plant coexistence. Ecological Society of America meeting, San Jose, CA

Bowman, W.D. 2006. Empirical determination of critical N loads for alpine vegetation. EPA, NPS, USDA workshop on Critical Loads, Charlottesville, VA, May 2006

Bowman, W.D., Gartner, J., Holland, K. and M. Wiedermann. Empirical determination of N critical loads for alpine vegetation. LTER All-Scientists meeting, Estes Park, September 2006

Williams, MW, TR Seastedt, WD Bowman, AR Townsend, and D McKnight. Niwot Ridge program and linked bio-math program for undergraduates. LTER All-Scientists meeting, September 2006, Estes Park, CO

Miller, AE, I Ashton, KN Suding, and WD Bowman. Competition influences nitrogen partitioning patterns and rhizosphere extracellular enzyme activity of alpine plants. LTER All-Scientists meeting, September 2006, Estes Park, CO

Meier, CL and WD Bowman. Carbon flux from plants to soil: phenolic effects on a nutrient availability feedback loop. LTER All Scientists Meeting, September 2006, Estes Park, CO

Bowman, W.D. 2006. Alpine ecosystem response to nitrogen deposition. Continental Divide Research Learning Center, Air Quality Day, National Park Service, Estes Park, February 8.

Meier, C.L. and W.D. Bowman. 2006. Phenolics, soil microbes, and plant growth: the importance of both low molecular weight and tannin phenolics. Ecological Society of America meeting, Memphis, TN.

Ashton, I, K.N. Suding, A.E. Miller, and W.D. Bowman. 2006. Competitors influence nitrogen partitioning via rhizosphere dynamics. Ecological Society of America meeting, Memphis, TN.

Bowman, W.D. 2005. Species make a difference – Biotic interactions and the functioning of alpine ecosystems. invited departmental seminar, Dartmouth College, Hanover NH.

Bowman, W.D. 2005 Life on a slope: Biodiversity and ecological functioning in mountains. Keynote presentation, Open Science Conference: Global Change in Mountain Regions, Perth Scotland, October, sponsored by UNESCO & Swiss Academy of Sciences.

Suding, K.N., A.E. Miller, W.D. Bowman, H. Bechtold. 2005. Resilience following loss of dominant species: Subdominant compensation buffers alpine tundra from significant functional change. Ecological Society of America meeting, Montreal, Canada.

Holland, K. A.R. Townsend, W.D. Bowman, and T.R. Seastedt. 2005. The changing nitrogen cycle in alpine tundra: Results from ^{15}N tracer experiments. Ecological Society of America meeting, Montreal, Canada.

Bowman, W.D. 2005. Susceptibility of communities to changes in diversity and implications for ecosystem function. Invited presentation, Symposium on Nitrogen Eutrophication in Xeric Wildland and Agricultural Systems (23rd Plant Biology Symposium), University of California Riverside, Jan 2005.

MTNCLIM 2005, Consortium for Integrated Climate Research in Western Mountains, invited final synthesis talk, biennial meeting, Pray, Montana, March 2005.

Organized symposium, Ecological Society of America and Global Mountain Biodiversity Assessment, "Functional Consequences of Mountain Biodiversity," held at the Ecological Society of America Meeting, Portland, OR, 2004

Bowman, W.D. Mechanisms influencing alpine plant diversity and the control on ecosystem function. Ecological Society of America Meeting, Portland, OR, 2004

Holland, K., A.R. Townsend, W.D. Bowman, and T.R. Seastedt. Short-term partitioning of ^{15}N in alpine tundra across a range of fertilization levels. Ecological Society of America Meeting, Portland, OR, 2004

Meier, C.L. and W.D. Bowman. Phenolic rhizodeposition and overwinter litter: Significant sources of C for microbes during the growing season? Ecological Society of America Meeting, Portland, OR, 2004

Bowman, W.D. Pristine no more? Air pollution and the alpine of Boulder County. Boulder County Nature Association, invited talk, April 2004

Bowman, W.D. Alpine ecosystem response to N deposition: The importance of biotic feedbacks. invited talk, University of Texas, San Antonio, March 2004

Bowman, W.D., Suding, K.N., and T.R. Seastedt. Alpine vegetation response to N deposition and feedbacks to ecosystem function. invited talk, High Altitude Revegetation Workshop, Colorado State University, February 2004.

Bowman, W.D. Process studies- biogeochemistry. Workshop on Mountain Research Initiative- Man and the Biosphere Reserves, Sörenberg, Switzerland. sponsored by UNESCO. November 2003

Bowman, W.D., K.N. Suding, J. R. Larson, and E. Thorsos· Plant modification of microbial biomass: A potential mechanism of competition? Guild of Rocky Mountain Population Biologists, 28th annual meeting, September 2003.

Damm, M.C. and W.D. Bowman. Alpine plant biogeography and species endemism in the Rocky Mountains. Ecological Society of America Meeting, Savanna, GA 2003

Bowman, W.D., Lubos Halada and Juraj Hresko. Susceptibility of alpine ecosystems to nitrogen saturation: a comparative study of the Southern Rocky Mountains and the Western Tatra Mountains. Central and Eastern European International Long-Term Ecological Research Conference, Warsaw, Poland, August 2003.

National Center for Ecological Assessment and Synthesis, workshop on Facilitation and competition on alpine elevation gradients: a global experiment on the organization of plant communities, May 27-June 3, 2003.

Bowman, W.D. Biodiversity of Rocky Mountain Alpine Vegetation: Causes and Consequences. Keynote address, Rocky Mountain Summit: Sustaining Ecosystems and Their People, sponsored by the University of Missouri, USGS, and NPS. Sept 22-25, 2002, Whitefish, MT.

Bowman, W.D. Alpine biodiversity as a bellwether of environmental change. Ecosystems to Earthquakes: International Year of the Mountain celebration, Cooperative Institute for Research in Environmental Science, November 15-17, 2002, University of Colorado, Boulder.

Miller, A.E. and W.D. Bowman. Species-specific competitive interactions alter plant uptake of organic and inorganic nitrogen. Ecological Society of America Meeting, Tucson, AZ 2002

Suding, K.N., J.R. Larson, E. Thorsos, and W.D. Bowman. Feeding the microbes, Can it confer a competitive advantage in plant-plant interactions? Ecological Society of America Meeting, Tucson, AZ 2002

Holland, K.J., A.R. Townsend, C.P. Snyder, and W.D. Bowman. Phosphorus availability limits nitrogen fixation across an alpine tundra soil age gradient. Ecological Society of America Meeting, Tucson, AZ 2002

Townsend, A.R., J.C. Neff, W.D. Bowman, and S.J. Lehman. Nitrogen additions change soil carbon structure and turnover times. Ecological Society of America Meeting, Tucson, AZ 2002

Bowman, W.D. Species make a difference- the role of plants in alpine ecosystems. Invited presentation, University of Bern, Switzerland, 2002

Bowman, W.D. Biodiversity and global change- A mountain perspective. Invited keynote presentation, 3rd annual Swiss Global Change Day, Bern, April 4, 2002

Bowman, W.D. Species make a difference- the role of plants in alpine ecosystems. Invited presentation, University of Zurich, 2002

Bowman, W.D., Steltzer, H., and Nash, K.N. Biotic response to nitrogen deposition in the Colorado alpine: Priming the N cycle pump? invited symposium, Nitrogen deposition in the Western U.S.... Is there cause for concern?, Ecological Society of America Meeting, Madison, WI 2001

Miller, A.E. and W.D. Bowman. Preferential uptake of N by alpine tundra species: do all species tap the same N pool? Ecological Society of America Meeting, Madison, WI 2001 (Amy Miller awarded the Billings Prize from ESA for this presentation)

Holland, K., A.R. Townsend, and W.D. Bowman. Phosphatase activity along an alpine age and nutrient gradient. Ecological Society of America Meeting, Madison, WI 2001

Bowman, W.D. and M. Damm. Causes and consequences of vascular plant diversity in the Rocky Mountain alpine. invited presentation, First International conference on Global Mountain Biodiversity (7-10. Sept. 2000 in Rigi/Kaltbad, Switzerland), sponsored by the Swiss Academy of Natural Sciences

Bowman, W.D. On the role of biotic interactions in structuring alpine plant communities. Keynote address in Community Ecology, Third conference on "The biochemistry, physiology, ecology, and population biology of Arctic and Alpine plants," 31 August - 2 September 2000 Lautaret Alpine Field Station, Villar d'Arène - Hautes-Alpes, France

Bowman, W.D. Biotic interactions and the structure and function of alpine ecosystems. invited presentation, Rocky Mountain Biology Lab, Gothic, Colorado, August 2000.

Miller, A.E. and W.D. Bowman. Differential utilization of N by co-occurring alpine tundra species: Field and greenhouse evidence. The Ecological Society of America, 85th Annual Meeting, August 6-10, 2000 Snowbird, Utah

Larson, J.R., W.D. Bowman, and K.N. Suding. The effect of litter quality on neighbor growth is dependent on nitrogen availability: Evidence from a greenhouse experiment with two alpine co-dominants. The Ecological Society of America, 85th Annual Meeting, August 6-10, 2000 Snowbird, Utah

Bowman, W.D. and K.N. Suding. Understanding Long-Term Ecological Data in the Context of Environmental Change: The Role of Field Experiments. NSF sponsored International Long-Term Ecological Research symposium, Central Europe, Nitra Slovakia, May 2000.

Bowman, W.D. Biotic Controls over Ecosystem Response to Environmental Change in Alpine Tundra of the Rocky Mountains. invited presentation, conference on Mountain Area Development III, the Americas, Abisko Sweden, sponsored by the Royal Swedish Academy of Sciences, August 1999

Miller, A.E. and W. D. Bowman. Differential uptake of inorganic and organic N by alpine tundra species. Annual Meeting of the Ecological Society of America, Spokane, WA, August 1999

Bilbrough, C. J., W. D. Bowman and J. M. Welker. Early spring nitrogen uptake by snow-covered plants, alpine and Arctic tundra plant function under the snowpack. invited symposium, Annual Meeting of the Ecological Society of America, Spokane, WA, August 1999

Bowman, W. D. and Steltzer, H. Plant manipulation of microbial biomass C and N in moist meadow alpine tundra. Annual Meeting of the Ecological Society of America, Spokane, WA, August 1999

Steltzer, H. and W. D. Bowman. Spatial variabilty in nitrogen cycling and species composition within moist meadow alpine tundra. Annual Meeting of the Ecological Society of America, Spokane, WA, August 1999

Bowman, W.D. Biodiversity and ecosystem function. Keynote address, DIVERSITAS workship, Glion, Switzerland, February 1999 (sponsored by Swiss Academy of Sciences).

Bowman, W.D. Process studies along altitudinal gradients and in associated headwater basins. Workshop on Global Change in Mountain Ecosystems, IGBP (GCTE and BAHC), Pontresina, Switzerland, April 1998.

Steltzer, H. and W.D. Bowman. Influence of plant species on community structure through control of spatial heterogeneity in nitrogen cycling in alpine tundra. Invited symposium, sponsored by Ecological Society of America and American Botanical Society, Annual meeting, Baltimore, MD August 1998.

Bilbrough, C.J. and W.D. Bowman. The timing of N uptake and patterns of allocation by five alpine species: Evidence for partitioning of N uptake among species. Ecological Society of America, Annual meeting, Baltimore, MD August 1998

Miller, A.E. and W.D. Bowman. Phenotypic plasticity in the utilization of nitrogen pulses by an alpine bunchgrass, Deschampsia caespitosa. Ecological Society of America, Annual meeting, Baltimore, MD August 1998

Bowman, W.D. Biotic control over alpine ecosystem structure and function: implications for response to global change. invited talk, University of Denver, November 1997.

Bowman, W.D. Air pollution effects on Rocky Mountain Ecosystems. invited talk, National Park Service sponsored workshop on Human-Induced Effects on Rocky Mountain Ecosystems, Sept. 18-20, 1997, Flathead Lake, MT

Bowman, W.D. and H. Steltzer. 1997. Positive feedbacks to anthropogenic N deposition in alpine tundra. Ecological Society of America Meeting, Albuquerque, NM.

Steltzer, H. and W.D. Bowman. 1997. Plant species, microclimate, and aboveground litter inputs can predict rates of net-nitrogen-mineralization in moist meadow alpine tundra. Ecological Society of America Meeting, Albuquerque, NM.

Bilbrough, C. and W.D. Bowman. 1997. Plant action under the snow: early season N uptake by alpine plants. Ecological Society of America Meeting, Albuquerque, NM.

Bowman, W.D. Integration of ecological and hydrological processes in mountain ecosystems. invited presentation, International Geosphere Biosphere Program, BAHC/GCTE joint meeting on future research on global change in mountain ecosystems, March 1996, Kathmandu, Nepal

Bowman, W.D. Potential ecological effects of long-term elevated N depostion on alpine ecosystems. invited presentation, NOAA Aeronomy Lab, Boulder, CO March 1996

International Long-Term Ecological Research- trip to the Czech Republic to promote alpine ecological research, June 1995

Bowman, W.D., B. Thomas, J.C. Schardt, S.K. Schmidt, and E.E. Grote. 1994. Influences of clovers on nitrogen inputs, production and community composition in alpine tundra. Ecological Society of America Meeting, Knoxville, TN

Theodose, T.A. and W.D. Bowman. 1994. The effects of neighbor and nitrogen availability on biomass and nitrogen accumulation and allocation in two alpine graminoids. Ecological Society of America Meeting, Knoxville, TN

Lipson, D.A., W.D. Bowman, and R.K. Monson. 1994. Luxury uptake and storage of nitrogen in the alpine plant, *Bistorta bistortoides*. Ecological Society of America Meeting, Knoxville, TN

Organization of Biological Field Stations, 1994, Flathead Lake, Montana

Environmental and biotic controls on alpine ecosystem function, invited talk, University of Utah, Spring 1994

Bowman, W.D. 1993. Nitrogen relations in alpine tundra vegetation- Potential concerns for nitrogen saturation. Eos, Transactions of the American Geophysical Union, 74: 257. (National meeting, San Francisco, CA)

Bowman, W.D., Theodose T.A., Schardt J. C., and Conant R.T. 1993. Constraints of nutrient availability on primary production in two alpine communities. Ecological Society of America Meeting, Madison, WI

Neff, J., W.D. Bowman, and E. Holland. 1992. Fluxes of methane and nitrous oxide from nitrogen amended soils in the Colorado alpine. International Geophysical Union Regional Meeting.

Bowman, W.D. 1992. Dynamics of shoot growth and photosynthesis in populations of the alpine willow *Salix glauca*. Guild of Rocky Mountain Population Biologists, Mountain Research Station (co-organizer).

Organization of Biological Field Stations Annual meeting, 1991, La Selva Biological Field Station, Costa Rica

Bowman, W.D. and T.N. Caine. 1991. Inputs and storage of N in winter snowpack in an alpine ecosystem. Ecological Society of America Meeting, San Antonio, TX

Bowman, W.D., R.K. Monson, J.L. Gehring, and S.D. Smith. 1990. Responses to water stress in two neighboring populations of *Encelia farinosa*. Ecological Society of America Meeting, Snowbird, UT.

Wessman, C.A., B.C. Gao, A.F.H. Goetz, and W.D. Bowman. 1990. Estimating abundance of major foliar biochemical constituents from leaf reflectance. Ecological Society of America Meeting, Snowbird, UT.

Goetz, A.F.H., B.C. Gao, C.A. Wessman, and W.D. Bowman. 1990. Estimation of biochemical constituents from fresh, green leaves by spectrum matching techniques. Proc. Intl. Goescience and Remote Sensing Symp.

Arid Ecosystems Interactions Workshop, UCAR-IGBP, Boulder, Colorado, October 1989.

W.D. Bowman, K.H. Hubick, S. von Caemmerer, and G.D. Farqhuar. 1989. Stress induced changes in carbon isotope discrimination in C_4 grasses, Ecological Society of America meeting, Toronto, August.

W.D. Bowman. 1988. Salt tolerance in a C_4 nonhalophyte. Ecological Society of America meeting, Davis CA, August.

W.D. Bowman. 1987. Physiological differentiation to salt stress in the C_4 nonhalophyte *Andropogon glomeratus*. XIV International Botanical Conference, Berlin, July.

W.D. Bowman. 1987. Physiological differentiation to long-term salinity stress in the C_4 nonhalophyte *Andropogon glomeratus*. Ecological Society of America meeting, Columbus OH, August.

W.D. Bowman. Alleviation of salinity stress by elevated CO_2. 1986. American Society of Plant Physiologists, Southern Section meeting, Charleston, SC March.

W. D. Bowman and B.R. Strain. 1986. Interaction between salinity stress and CO_2 enrichment in a C_4 nonhalophyte, Ecological Society of America meeting, Syracuse, NY.

W.D. Bowman, S. W. Roberts. 1985. Seasonal changes in water relations parameters in chaparral shrubs. Ecological Society of America meeting, Minneapolis, MN, .

W.D. Bowman, S.W. Roberts. 1984. Changes in components of water potential of selected chaparral shrubs during seasonal drought. Ecological Society of America meeting, Grand Forks, ND.

Conferences Hosted

Guild of Rocky Mountain Population Biologists, 1992, 1998, 1999, 2001, 2003, 2004, (morphed into Guild of Rocky Mountain Ecologists and Evolutionary Biologists) 2005, 2006, 2008, 2009, 2011, 2012, 2015, 2017 annual meetings Mountain Research Station

Western Forest Genetics Conference, 1992, Mountain Research Station

Grants and Contracts Received

Extramural Support

NSF, Acquisition of Nine Controlled Growth Chambers, $113,015 1/89-12/91 (co-PI with Russ Monson, Barbara Demmig-Adams, William Adams, and Steve Schmidt).

NSF, Effects of climate change in the Colorado alpine, LTER program, $1,100,000, 1/91-10/92 (Co-PI, Group leader for Plant and Soil Processes, annual budget of $60,000)

NOAA, Maintenance of an Aeronomy Sampling Station at Niwot Ridge, $28,540, 4/91-12/92 (PI)

NSF, Enhanced Computer Network and Climate Data Management Capabilities for the Niwot Ridge LTER Site, $22,520, 6/91-5/92 (PI with Nel Caine)

NSF, Improvement of Winter Research Logistics and Water Facilities at the Mountain Research Station, $36,540, 1/92-12/93 (PI)

EPA, Biotic and abiotic controls of N_2O fluxes from alpine ecosystems, $200,000, 9/92-9/94 (co-PI with Steve Schmidt and Beth Holland)

NSF, Effects of climate change in the Colorado alpine, LTER program, $3,540,000, 10/92-9/96 (Co-PI, Group leader for Plant and Soil Processes, annual budget of $67,000)

NSF, Creation of a Trace Gas Laboratory at the Mountain Research Station, $31,425, 10/92-9/93 (co-PI with Tim Seastedt, Russ Monson, and Steve Schmidt).

EPA, The effects of anthropogenic nitrogen deposition on the functioning of alpine and subalpine ecosystems, Exploratory Grants, 5/96-5/98, $341,662, (co-PI)

Mellon Foundation, Environmental control over biotic properties of alpine plant communities (PI), 12/94-5/98, $230,000

NSF, Construction of a multi-user hostel at the Mountain Research Station, $190,000 (PI), 10/96-9/98

Mellon Foundation, Partitioning of Nitrogen by Alpine Tundra Plants: Implications for Species Coexistence, 10/97--8/02, $240,000 (PI, with Amy Miller co-PI)

NSF,: Controls on the Structure, Function and Interactions of Alpine and Subalpine Ecosystems of the Colorado Front Range: The Niwot Ridge Long-Term Ecological Research Program 1998-2004 (Co-PI, Tim Seastedt PI, multiple co-PIs, group leader for biotic processes, $75,000 annual budget)

NSF, Undergraduate Research in Ecology and Behavior (REU site grant, co-PI with Michael Breed), 6/01-5/04, $200,455

Mellon Foundation, Consequences of Plant Species Effects on Nitrogen Cycling: Can Ecosystem Modifications Shift Competitive Rankings? (PI with Katherine Nash Suding), 5/01-4/04, $280,000

NSF, Responsiveness of alpine vegetation to N inputs- A Comparison Between Central European and North American Sites (PI, International Program), 8/01-7/04, $63,461

NSF-INT, Responsiveness of alpine vegetation to N inputs: A comparison between Central European and North American sites, REU and Travel supplement (PI) $17,082, 05/03-05/04

NSF REU Site: Undergraduate Research in Behavior, Ecology, and Evolution. co-PI $240,084. (5/04-5/07)

NSF-DEB, Long Term Ecological Research: The Landscape Continuum Model: A Biogeochemical Paradigm for High Elevation Ecosystems, 10/04-10/10, (CoI on plant-soils component) $4,920,000

NSF REU Site: Undergraduate Research in Behavior, Ecology, and Evolution. PI $223,684. (5/07-4/10)

National Park Service (Rocky Mountain CESU), CRITICAL LOADS OF ATMOSPHERIC N DEPOSITION IN ALPINE VEGETATION IN ROCKY MOUNTAIN AND GLACIER NATIONAL PARKS $99,523 (5/05-12/09)

Long Term Ecological Research: The Landscape Continuum Model: A Biogeochemical Paradigm for High Elevation Ecosystems (Niwot Ridge LTER). $4,920,000 NSF DEB 10/01/04 - 09/30/10 coI

NSF, DEB Ecosystems panel (DDIG), Vegetation Effects on Nitrogen Cycling Hotspots in an Alpine-Subalpine Ecosystem (in support of Anthony Darrouzet-Nardi's PhD thesis), $11,883 (05/08-04/10)

Graduate Teaching Fellows in Ethnically Diverse Classrooms: A Collaborative Model for Impacting Science Teaching and Learning in Boulder County, Colorado Public Schools. $ 2,958,170 NSF DBE 5/31/08—4/30/14 coI

Critical Loads for Nitrogen Desposition in Rocky Mountain National Park, Temporal Changes in Vegetation and Soil Chemistry, Interior National Park Service, $55,303 09/01/2009 to 12/31/2012, P.I.

Renovation and Expansion of the Kiowa Teaching Laboratory at the University of Colorado Mountain Research Station. $ 275,273 NSF DBI 9/1/10—12/31/12 PI

NSF REU Site: Achieving heightened goals: Undergraduate Research in Behavior, Ecology, and Evolution at the Mountain Research Station. PI $263,734. (5/10-4/13)

Rocky Mountain CESU, Compare and contrast sister park's research findings and monitoring efforts (Rocky Mountain National Park and Tatras National Park), $12,000 (provided RA for Amy Churchill), 9/11- 12/13

Rocky Mountain CESU, Plant community effects on ecosystem response to nitrogen deposition, $12,000 (supports Amy Churchill's research), 5/12-12/14

EPA, Evaluation of potential nitrogen deposition gradients and associated changes in plant diversity. PI $74,000 7/2012-6/2013

USGS, Powell Synthesis Center, Evidence for shifts in plant species diversity along N deposition gradients: a first synthesis for the United States, coI, $100,000, 10/12-9/15

Rocky Mountain CESU, Evaluating the Influence of Nitrogen Deposition Gradients on Plant Diversity: Filling in the Gaps. PI, $64,848, 6/13-03/15

NSF REU Site: Achieving heightened goals: Undergraduate Research in Behavior, Ecology, and Evolution at the Mountain Research Station. PI $ 307,184. (3/15-2/18)

<u>Intramural Support</u>
University of Colorado, Council for Research and Creative Work, Grant-in-Aid, Environmental Effects on Carbon Isotope Discrimination, Photosynthesis, and Growth in C_4 Grasses, 3/89-3/90, $4740

University of Colorado, Council for Research and Creative Work, Junior Faculty Development Award, Nutrient Limitation of Plant Growth in Alpine Tundra, 1/90-12/90, $5000

University of Colorado, Council for Research and Creative Work, Grant-in-Aid, Resource Use Efficiencies Across a Gradient of Snow Accumulation in an Alpine Ecosystem, 6/92-5/93, $3700

<u>Participant</u>

NSF, Undergraduate Research in Ecology and Behavior, 1990-1998 (Deane Bowers and Mike Breed, PI's)

Consulting

National Park Service, Air Quality Division
University of Denver/ U.S. Forest Service, Clear Creek District
Colorado Mountain Club
U.S. Forest Service, Coconino National Forest

Courses Taught

EPOB Graduate Seminar, Current Perspectives in Plant Ecology, Fall 1989
EPOB 4120/5120 Ecosystems Ecology, 28 students, Spring 1990 (new course)
EPOB 3020 Principles of Ecology, 196 students, Fall 1990
Hughs Course, Advanced Physiology, plant water relations module, Spring 1990
EPOB 3020, Principles of Ecology, 202 students, Spring 1992
Hughs Course, Ecology and Evolution, winter ecology module, Spring 1992
EPOB 4630, Field Techniques in Environmental Science, Fall 1992
EPOB 3020, Principles of Ecology, 198 students, Spring 1993
EPOB 6200, Graduate Seminar, Alpine Ecology, 15 students, Fall 1993
EPOB 3020, Principles of Ecology, 115 students, Spring 1994
EPOB 3020, Principles of Ecology, 110 students, Spring 1995
EPOB 3020, Principles of Ecology, 98 students, Fall 1995
EPOB 6120, Environmental History, 18 students, Fall 1995
EPOB 4800/5800, Ecology of Plant/Soil Interactions, Spring 1997, 18 students
EPOB 3020, Principles of Ecology, 2 sections (co-taught, 280 students) Fall 1997
EPOB 3020, Principles of Ecology, 146 students, Fall 1998
EPOB 6200, Causes and Consequences of Plant Biodiversity, graduate seminar, 20 students, Fall 1999
EPOB 3020, Principles of Ecology, 65 students, Spring 2000
EPOB 2650, Honor's General Biology, 16 students, Fall 2000
EPOB 3020, Principles of Ecology, 70 students, Spring 2001
EPOB 3140, Plant Ecology, 22 students, Fall 2001
EPOB 3140, Plant Ecology, 67 students, Fall 2002
EBIO 4140, Plant Ecology, 40 students, Fall 2004
EBIO 6200, Ecological impacts of nitrogen deposition, Spring 2005
EBIO 4140, Plant Ecology, Fall 2006, 20 students
EBIO 2040, Principles of Ecology, 168 students, Fall 2008
EBIO 2040, Principles of Ecology, 188 students, Fall 2009
EBIO 2040, Principles of Ecology, 196 students, Fall 2011
EBIO 6200, Ecology and Plant-Soil interactions, Spring 2011
EBIO 6200, Science Communication graduate seminar, 22 students, Spring 2012
EBIO 2040, Principles of Ecology, 138 students, Fall 2012
EBIO 2040, Principles of Ecology, 136 students, Fall 2013

EBIO 2040, Principles of Ecology, 139 students, Fall 2014
EBIO 6100, Science Communication Graduate seminar, 5 students, Spring 2016
EBIO 2040, Principles of Ecology, 98 students, Fall 2016
EBIO 2040, Principles of Ecology, 130 students, Fall 2018
EBIO 2040, Principles of Ecology, 119 students, Fall 2019

Postdoctoral Advisees

1) Carol Bilbrough, 1996-1998, Physiological and morphological responses of plants to pulsed resource supply, supported by Mellon Foundation

2) Katherine Nash Suding, 1999-2003, Influence of plant control over nutrient cycling on community composition in alpine tundra, supported by Mellon Foundation, currently Professor, University of Colorado, Boulder

3) Courtney Meier, 2008, Influence of phenolic compounds on soil biogeochemistry, currently Plant Ecologist with the National Ecological Observatory Network

4) Sam Simkin, 2012-2015, Assessment of plant diversity responses to nitrogen deposition

Students Advised

Principal Graduate Advisor

1. Terry Theodose, Ph.D. Biotic and abiotic influences on competition in alpine plants, degree May 1995, currently Associate Professor, University of Southern Maine
2. Edmund Grote, M.A. Environmental controls on nitrogen fixation in alpine *Trifolium* species, degree May 1995, currently research technician, US Park Service
3. Heidi Steltzer, Ph.D. Plant species effects on spatial variation in N cycling in the alpine, supported by CU chancellor's fellowship and National Science Foundation predoctoral graduate fellowship, degree awarded December 1999, currently Assistant Professor, Fort Lewis College
4. Lee Turner, Ph.D. Influence of snow on phenology and species composition in alpine tundra, degree awarded December 2002
5. Amy Miller, Ph.D., Partitioning of nitrogen among alpine tundra species, supported by Mellon Foundation training/research grant, recipient of Billings award for best oral presentation in physiological ecology at the 2001 Ecological Society of America meeting, Madison WI, degree awarded May 2002, currently with National Park Service vital signs monitoring network, southeast Alaska division
6. Mary Damm, M.B.S. Patterns of plant diversity and plant resources in alpine tundra, degree awarded August 2002

7. Tara Forbis, Ph.D. Seedling recruitment in alpine vegetation (co-advised with Tim Seastedt), degree awarded December 2002, currently with USDA Forest Service, Reno NV

8. Julia Larson, M.S. Influence of carbon and nitrogen additions on microbial activity in alpine soils, degree awarded, May 2003, currently teaching high school biology, Hanover NH

9. Courtney Meier, Ph.D. Chemical diversity of plants as a component of biodiversity, and its impact on ecosystem function, degree awarded May 2008, currently Science Officer, NEON Inc.

10. Anthony Darrouzet-Nardi, Ph.D. Hot spots of nitrogen cycling in an alpine landscape, degree completed May 2010, currently Assistant Professor, University of Texas El Paso

11. Kallin Tea, PhD Spatial heterogeneity in soils and the potential for invasibility in prairies (completed PhD 2013), currently environmental consultant

12. Rebecca Harris, MA Mountain pine beetle effects on species invasions in subalpine forests, currently teaching biology in Boulder, Utah

13. Amber Churchill, PhD, Resilience of alpine plant communities to nitrogen deposition, completed PhD 2017, currently postdoc, Hawkesbury Institute for the Environment, Western Sydney University

14. Teal Potter, PhD, Plant soil interactions influencing plant response to environmental change, completed degree in 2018, currently a postdoc at University of Wisconsin, Madison.

15. Kelsey Elwood Carter, MA, Spatial variation in plant phenology in relation to snow melt-out date in alpine tundra communities

16. Chiara Forester, PhD, Impacts of climate warming on phenology and plant-fungal interactions

<u>Graduate Student committees</u>

1. Renee Mullen, Ph.D., Temporal Aspects of Mycorrhizal Fungi infection in *Ranunculus adoneus*

2. Anna Arft, M.A. Environmental Influences on Isoprene Emissions from *Populus tremuloides*

3. Bruce Burns, Ph.D. Geography, Regeneration in *Auracaria aracana*

4. Antonio Lara, Ph.D. Geography, Dynamics and Disturbance Regimes of the *Fitzroya cupressoides* Forests in the Chilean Andes

5. Charles Coxwell, M.A., Ecological Influences on Colorado Alpine Grasshopper Communities.

6. Laurie Anderson, Ph.D. (substitute committee member) Influence of Water Relations and Genetics on Spruce-Fir Coexistance in the Rocky Mountains.

7. Kanya Santanachoate, Ph.D. (substitute committee member) Maintenance of Tall Grass Prairie in Boulder County

8. Jennifer Grinspoon, M.A. Chemistry, Influence of Leaf Age on Isoprene Emissions from Velvet Bean

9. Melany Fisk, Ph.D., Carbon sources and microbial activities in alpine soils

10. Paul Brooks, Ph.D., Microbial biomass dynamics and nutrient status in winter and spring snowpack in an alpine ecosystem.

11. Bob Arenz, M.A., Remote sensing of alpine lake primary productivity

12. Laura Backus, M.S., Volatile nitrogen emissions associated with biomass burning

13. Marcy Litvak, Ph.D. Constraints on monoterpene emissions from plants

14. David Goldblum, Ph.D. (Geography) The role of treefall gaps and forest edges on understory vegetation dynamics in a mixed deciduous forest

15. Anna Hopkins, Ph.D. Effects of land management on nutrient cycling in relictual tallgrass prairie

16. David Barker, Ph.D. Photoprotection in CAM plants

17. Arne Sjodin,.M.A. Modeling of nitrate in lotic ecosystems

18. Susan Sherrod, Ph.D. effect of pocket gophers on alpine community and ecosystem properties

19. Kim Wickland, M.S. trace gas emissions from alpine wetlands

20. Allison Aydelotte, M.S. developmental plasticity in an alpine forb

21. Ruth Ley, Ph.D. Microbial activity in talus soils

22. David Lipson, Ph.D. Plant-microbial interactions in alpine soils

23. Jon Carrasco, Ph.D. Influence of N deposition on Lodgepole Pine and Aspen forests in the Front Range

24. Tara Forbis, Ph.D. Sexual reproduction and genetic structure of alpine plant communities

25. Cory Cleveland, Ph.D. Microbial control over P fluxes in wet tropical forests

26. Joseph Donnegan, Ph.D. (Geography), Forest History of Pike National Forest, Colorado

27. Rebecca Rawlinson, M.A. Invasive plant species effects on plant communities

28. Keri Holland, Ph.D. N sinks in alpine ecosystems under N and P fertilization

29. Dan Liptzin, Ph.D. Influence of tree islands on soil biogeochemistry

30. Eileen Gardner, MA Biological indicators of lake chemistry

31. Eric DeChaine, Ph.D. Phylogeography of alpine plants and specialist herbivores

32. Carl Bern, PhD. Use of strontium to determine atmospheric versus weathering sources of nutrients

33. Kasey Barton, Ph.D. Variation in production of plant secondary compounds in juvenile and adult plants

34. Ryan Zarter, Ph.D. Photoprotection in high altitude conifers

35. Todd Rosenstiel, Ph.D. Biochemistry of isoprene production

36. Tamara Jane Zelikova, PhD. Impact of ant dispersal on regeneration of tropical dry forests

37. Sasha Reed, PhD. Controls on N_2-fixation in tropical forests

38. Elisa Miller, PhD. The influence of forest management on establishment of invasive species

39. Nataly Ascarrunz, PhD, C and N dynamics across a woodland-grassland interface in Ecuador.

40. Leticia Sanchez, PhD, Assembly rules in subalpine ant communities

41. Jia Hu, PhD, Coupling of the hydrologic cyle and C fluxes in a subalpine forest

42. David Knochel, PhD

43. Monica Madronich, PhD

44. Lynette Laffea, PhD

45. Mark Bradburn, MA

46. Mary Jamieson, PhD

47. Kendra Morliengo-Bredlau, MS

48. William (Charlie) Lawton, PhD

49. Laura Burkle (outside examiner- Dartmouth College) Fitness consequences of a plant insect mutualism as influenced by soil nutrient availability

50. Andrew King, PhD, Geostatistical relationships among soil, microbial, and plant communities

51. Nicole Trahan, PhD

52. Christopher McGuire, MA, ENVS- Grasshopper abundance along an altitudinal gradient in the Front Range

53. Susan Whitehead, PhD

54. Carolina Quintero, PhD

55. Will Weider, PhD

56. Matt Dumlao, MA

57. MaryKay Herzenbach, PhD

58. Sarah Castle, M.S. (GEOL)

59. Kelly Ramirez, PhD

60. Eve Gasarch, PhD

61. Jeremy Smith, PhD (GEOG)

62. Rick Leyva, MA

63. Janet Prevey PhD

64. Taryn Morris PhD

65. Jeff Morton, PhD

66. Scott Ferrenberg, PhD

67. Joey Knelman, MA

68. Jared Stewart, MA/PhD

69. Miranda Redmond, PhD

70. Megan Caldwell, PhD

71. Becky Poore, MA

72. Sarah Hart, PhD (Geography)

73. John Knowles, PhD (Geography)

74. Mathew Sharples, PhD

75. Cliff Bueno de Mesquita, PhD
76. Eric Gordon, MA
77. Jon Leff, PhD
78. Eric Winchell, PhD (Geology)
79. Carrie Havrilla, PhD
80. Margaret Mitter, PhD
81. Jarret Roberts, MA
82. Brian Sechler, MA

Undergraduate Independent Study/Research, Sole or Principal Advisor

1. Delores Delgado, Remote sensing of plant production, summer 1989, SMART Program
2. Sandra Lopez, Effect of nitrogen nutrition on photosynthesis, summer 1989, SMART Program
3. Lynette Hampton, Effect of Ozone on Chloroplast Ultrastructure and Leaf Spectral Reflectance, 3 credits, Spring '90
4. Richard Conant, Remote sensing of plant processes, 3 credits, Spring '90
5. Petra Schulze, Active Uptake of Na^+ by Roots of *Andropogon glomeratus* Ecotypes, Spring '90 CIRES/CCHE Program
6. Richard Conant, Influence of fertilization on foliar chemistry in alpine plants, summer '90, fall '90, NSF REU Program, (Received PhD from Arizona State Univ.)
7. Mollie Kleinman, Influence of fertilization on herbivory by phytophogous insects in alpine plants, summer '90- NSF REU Program
8. Susan Hoffmeister, Effect of N nutrition on leaf carbon isotope composition in C_4 grasses, CIRES/CCHE Program (completed graduate work at the Colorado School of Mines)
9. Matthias Volk, Differences in UV-absorbing pigment concentration of leaves of *Micranthes rhomboidea* along an altitudinal gradient, summer '90 CIRES/CCHE Program (Received PhD from University of Bern, 2000)
10. Peter Stout, Bachelor's Honors Program, Effect of temperature and water regimes on competition between C_3 and C_4 grasses, graduated summa cum laude (completed graduate work at Colorado School of Mines)
11. Lee Turner, Effect of long-term and short-term temperature regimes on photosynthesis in populations of *Bouteloua* , independent research (completed PhD, University of Colorado).
12. Jason Neff, Methane and N_2O emission from alpine tundra, NSF REU Program and Honor's Program (PhD completed, Stanford University, recipient of NSF predoctoral fellowship, currently faculty at CU)
13. Kim Isaacs, Ecotypic differentiation to temperature in populations of *Bouteloua*, NSF REU Program
14. Mike Uilean, Feeding preference in snowshoe hares during the winter
15. James Schardt, Spatial distribution of nitrogen fixation by *Trifolium* species in alpine tundra, honor's thesis, graduated magna cum laude (currently working for EPA in Chicago)

16. David Barker, Effect of soil nutrient status on seed germination of alpine plants, UROP Grant (received PhD, Univ. of Colorado)

17. Supatra Hanna, Fertilization effects on leaf anatomy and reproductive biology of *Saxifraga rhomboidea*, independent research

18. Brian Thomas, Influence of *Trifolium* presence on species composition, primary production, and soil N pools in alpine tundra. NSF REU program and EPOB honors, graduated summa cum laude, selected outstanding graduate of the College of Arts and Sciences, Fall 1993 (completed PhD, Stanford University)

19. Petique Mlaker, Ecotypic differentiation in response to nutrient regimes in alpine tundra, Hughes Initiative/URAP program.

20. Daniel Dvorkin, Life history traits of plant growth forms in alpine tundra, independent study

21. Shelly Cole, Controls over biodiversity in alpine tundra, REU program

22. Renata Bradford, Landscape patterns of foliar N and P concentration in relation to indices of N availability, REU Program

23. Amy Keller, Altitudinal variation in foliar N and P in Green Gentian populations- supported by Mellon Foundation grant

24. Emily Gorton, Response to pulsed resource availability in populations of Alpine Avens, independent research

25. Alex Gallego, Use of snow-water and summer precipitation-water by alpine plants. funded by Mellon Foundation and NSF Biosphere-Atmosphere interaction grant., 1996

26. Julie (Allie) Osborne, Patterns of diversity in alpine tundra, REU program, 1996

27. Koko Pipkin, Root proliferation in fertilized microsites in alpine tundra, REU program, McNair Program, 1997

28. Julia Larson, Influence of alpine avens on growth of *Deschampsia caespitosa* REU Program, 1997 (completed M.S. Univ of Colorado)

29. Naren Wadwhani, Influence of soil P on mycorrhizal infection in *Trifolium* species. REU Program, 1997

30. Leslie Bahn, Influence of soil age and indices of nutrient availability on foliar N and P concentrations in alpine plants. REU Program, Senior Thesis, Columbia University, 1999

31. Kristi Aarsby, Variation in phenolic production in *Acomastylis rossii*- influence of community type, UV irradiance, and N fertilization. REU Program, Senior Thesis, Luther College, Iowa, 2000

32. Eileen Thorsos, Influence of species removals on soil processes and diversity in the alpine. REU student from Swarthmore College, 2001 (currently a grad student at Duke University)

33. Caroline Snyder, Soil age effects on phosphatase activity in alpine soils. REU Program, 2001 (co-advised with Alan Townsend).

34. Tim Morrisey, Effect of augmented snow on soil N cycling. Independent Research project, in conjunction with the University of York. summer 2001

35. Meredith Albright, Influence of snow on phenology of 2 alpine species. REU program, 2002 (PhD student, CU Geography)

36. Colin Tucker, Plant litter effects on alpine soil microbial activity. REU program, 2002, and EPOB undergraduate Honors (Magna cum Laude, 12/03) (currently a grad student, University of Wyoming)

37. Sara Desplaines, The influence of diversity on N sequestration in alpine dry meadows. REU supplement to NSF-INT, honors thesis (Summa cum laude)

38. Julitza Nieves, Soil indicators of N saturation in alpine dry meadows. SMART Program, from University of Puerto Rico, 2003

39. Meg Mobley, Landscape influences on plant species effects on N cycling, REU student from Duke University, 2003 (completed PhD from Duke)

40. Michelle Huyser, Hobart and Smith College, Species effects on soil nitrogen transformations in the alpine, REU program, 2004, currently in medical school

41. Olofron Plume, Vegetation indicators of N deposition in alpine dry meadow communities. REU program & independent study, University of Colorado, 2005, currently in grad school at Cornell.

42. Sarah Judkins, Fairview High School- advisor on project comparing arctic and alpine ecosystems. 2005

43. Melissa Maxa, University of Minnesota, Influence of litter diversity on soil respiration in alpine moist meadows. REU program 2006

44. Rose Kieth, senior, New Vista High School- mentor for science fair project 2006/2007

45. Michael Sekor, Vassar College, Ecophylogenetics of alpine plants- evidence for competitive structure? REU program 2007

46. Kaleb Keyserling, Kenyon College, Effect of root exudates on plant growth in alpine moist meadows, REU program, 2008, currently in medical school

47. Samantha Swatling-Holcomb, Humboldt State University, Spatial patterning of alpine plants in 3 communities: are species organized by competition? REU program, 2009, currently in graduate school at NCSU

48. Andrea Dixon, Honors thesis, The influence of cushion plants on fellfield species composition, Climate Change and Alpine Ecosystems, (independent study), Spring 2010

49. Evan Fricke, Bowdoin College, influence of warming on soil N cycling in alpine tundra (currently in PhD program, University of Washington)

50. Jay Arehart, Fairview High School- use of lichens as monitors of air pollution

51. Annie Henry, Honors thesis, The use of lichens as indicators of N depsoition (cum magna, Fall 2011, currently PhD student, University of Denver)

52. Jennifer Jones, REU program, The effect of Mountain Pine Beetle mortality on soil N cycling in limber pine stands (summer 2011, currently PhD student, Indiana University)

53. Jarrett Roberts, EBIO Honors thesis- Influence of wind breaks on restoration of alpine tundra using turfs (magna cum laude, Fall 2012)

54. Cliff Bueno de Mesquita, Recovery of alpine communities and soils following cessation of N deposition (REU Program, summer 2012)

55. Brian Shreve, The role of dust deposition as a source of base cations for soil buffering and plant nutrition in acidified alpine soils (independent study/ honors, 2013/2014)

56. Stefanie Sternnagel, Honors Thesis, influence of nitrogen deposition on fungal biomass and community composition in alpine tundra

57. Max Owens, Honors Thesis (summa cum laude awarded 2015), Influence of aluminum on the growth and survival of two alpine sedges

58. Megan Budnik, REU program 2015, Cold tolerance in different populations of cheatgrass from an elevational transect

59. Kaya Munoz, independent study (3 credits, Fall 2015)

60. Carah Bordner, independent study (1 credit, Fall 2015)

61. Ben Murphy, REU summer 2015, independent study Spring 2016

62. Asma Ayad, REU summer 2016

63. Savannah Adkins, REU 2017

64. Emily Joy, REU 2018

65. Nyika Campbell, Honors student, expected May 2021

Departmental/ University Service

CIRES Reappointment Committee, Fall 1989
EPOB Plant Systematics Search Committee, Spring 1990
EPOB Chair of Greenhouse Committee, 1990/1991, member 1991/1992, 2006/2007
Director, Mountain Research Station, 1991-present
EPOB Graduate Committee, 1990/1991
INSTAAR/LTER Executive Committee 1990/1991, 2010 to present
President's Committee on Environmental Studies and Global Change, Spring 1991
EPOB / INSTAAR Ecosystem Scientist search committee, Spring 1991
INSTAAR Executive Committee 1992-present
INSTAAR Reading Room Committee 1992/1993
EPOB Executive Committee 1992/1993
Associate Dean's committee, A&S, Review of Environmental Conservation Program 1992/1993
EPOB, internship faculty advisor, 1993-2000
INSTAAR, committee on diversity 1993
INSTAAR, search committee for a new INSTAAR Director, Spring 1994
Chair, search committee for Evolutionary Vertebrate Biology faculty, INSTAAR/EPOB/MRS, Spring 1995
EPOB, Chair, promotion committee for Tom Lemieux, 1996
INSTAAR, space committee, 1997-1999
EPOB, undergraduate club faculty advisor, 1998-2001
EPOB, Chair, reappointment committee for Tom Lemieux, Fall 1999
EPOB, Chair, Environmental Biology Section, 2000- 2001
EPOB, Executive Committee, 2000-2001

EPOB, Reappointment committee for Eric Stone, Instructor, Fall 2000
EPOB, Search committee for Integrative Physiologist, Fall 2001
EPOB, Space committee, Fall 2001-2003
INSTAAR, Reading room committee, 2002-2003
INSTAAR, Personnel evaluation committee, 2002-2003
EPOB, Chair, search committee for Ecologist 2002-2003
EBIO, Executive Committee, 2004-2006
EBIO, search committee, ecologist, 2004/2005
EBIO, Associate Chair, Graduate Committee 2005/2006
EBIO, Graduate Committee, 2006-2008
Chair, Brett Melbourne interview committee (tenure-track hire), EBIO 2007
EBIO Budget Committee, 2008
Promotion Committee, full professor, Andrew Martin (chair) Fall 2009
Search committee, Director of Science Discovery Spring 2010
Promotion and Tenure Committee (chair), Diana Nemergut (ENVS and INSTAAR, Fall 2011)
Reappointment committee (chair), Brett Melbourne, Fall 2012
Promotion and Tenure Committee (chair), Nichole Barger, Fall 2013
EBIO Teaching Review committee, 2012/2013
Promotion and Tenure Committee (chair), Kendi Davies, Fall 2014
Promotion to Full Professor, Katherine Suding, Fall/Winter 2014/2015
Search Committee for MRS Station Manager, Spring 2015
Promotion and Tenure Committee (chair), Brett Melbourne, Fall 2015
Promotion and Tenure Committee (chair), Stacy Smith, Fall 2016
Promotion to Full Professor (chair), Nichole Barger, Fall 2019
EBIO Executive Committee, Fall 2014 to present
Associate Chair for EBIO, Chair Graduate Studies, Fall 2014 to present

Professional Service

Editor, Arctic, Antarctic and Alpine Resarch (2007 to present)
Associate Editor, Arctic, Antarctic and Alpine Research (2004 to 2007)
NSF DBI REU Panel, Fall 2010
NSF DEB Ecosystems Panel, Fall 2009
Editorial Review Board, *Tree Physiology* 1999

ad-hoc reviews, Journals: *American Journal of Botany, Arctic (Antarctic) and Alpine Research, Ecology, Ecological Applications, Ecological Monographs, Global Change Biology, Great Basin Naturalist, Nature, Oecologia, Oikos, Physiologia Plantarum, Plant and Soil, Plant Cell and Environment, Plant Physiology, Remote Sensing of Environment, Trends in Ecology and Evolution*
Granting Agencies: NSF: atmospheric sciences, ecology, ecosystems, and physiological ecology and population biology panels, USDA ecosystems, DOE

External review for faculty promotion, University of Colorado, Colorado Springs (Fall 2018), University of Denver (Fall 2015), University of Texas, San Antonio (Fall 2011, 2014), New Mexico State University (Fall 2011), University of Vienna (Fall, 2011), University of Texas Arlington (Fall 2012), Villanova University (Fall 2012), Colorado State University (Fall 2012)
External review for undergraduate major (Biology and Geography combined degree), Maynooth University (Ireland) 2018
Candidate evaluation committee, Vegetation ecologist, University of Vienna (Fall 2011),
NSF Review Committee, Toolik Lake LTER program (2019), Cedar Creek LTER Program (2003)
Strategic Planning Committee, Fraser Experimental Forest, U.S. Forest Service, 2001
Co-Task Leader, Mountain Research Initiative, GCTE/BAHC- International Geosphere Biosphere Programme, 1998 to 2001
Steering committee, "Protected Areas and National Parks and Global Change" symposium celebrating the establishment of Abruzzo National Park, Italy, September 1999
Conference board, North American Representative, Global Mountain Biodiversity Assessment, a program within DIVERSITAS, sponsored by the Swiss Academy of Sciences, 1998 to 2005
Advisory board, The Fourth Conference on Biochemistry, Ecophysiology and Population Biology on Alpine and Polar Plants, Innsbruck, Austria, summer 2003.