Adrienne Blair Keller, PhD

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EDUCATION

Indiana University, Department of Biology 2014-2020
Ph.D. in Ecology
Thesis: On the relationship between plant nutrient use strategies and soil biogeochemistry from individual trees to biome scales

University of Montana, Department of Ecosystem & Conservation Science 2009 – 2011
M.S. in Resource Conservation
Thesis: Effects of different canopy tree species on belowground ecosystem processes in a wet lowland tropical forest

Macalester College 2002 – 2006
B.A. in Biology and Geography
Thesis: Microbial biomass and enzyme activity responses to elevated N and P deposition: a comparison between temperate and tropical soils

RESEARCH FOCUS

I am a terrestrial ecosystem and global change ecologist. I work at the intersection of ecological research and land management. Collaborating with research scientists and natural resource professionals, I investigate how social-ecological factors interact with one another and with environmental changes to drive ecosystem functioning (e.g., carbon and nutrient cycling, biodiversity). I also examine the effects of land management actions (e.g., prescribed fire, forest thinning) on ecosystems. Recognizing rates of climate change and disturbance are high, increasing, and interacting in new ways, I focus on how climate adaptation can support management goals. My research spans multiple systems (forest, savanna, grassland, wetland, agricultural, and urban systems) and scales (lab incubations to greenhouse and field studies to regional and global data syntheses). I am particularly interested in applying sound science to equitable and climate-informed land management policies and practices.

PROFESSIONAL EXPERIENCE

2023 – **Research Assistant Professor**, *College of Forest Resources and Environmental Science, Michigan Tech University, and the Northern Institute of Applied Climate Science. Houghton, MI.* Provide technical expertise in carbon science and management to natural resource practitioners. Engage in ecosystem science and

climate adaptation research. Coordinate team's carbon-related work and liaise with external partners on carbon projects.

2022 – 2023 **Climate Adaptation Specialist**, *College of Forest Resources and Environmental Science, Michigan Tech University, and the Northern Institute of Applied Climate Science. Houghton, MI.* Synthesized research and produced science delivery products on climate adaptation and carbon stewardship for land managers. Developed framework for land managers to evaluate co-benefits and trade-offs when managing for multiple goals (e.g., carbon storage and biodiversity). Developed and led climate adaptation workshops for land managers in the Upper Midwest and Northeast region. Provided technical support to USFS staff on forest carbon management. Assisted staff with assessing and enhancing DEIJ in our work.

2022 – **Visiting Research Scholar**, *Department of Ecology, Evolution and Behavior, University of Minnesota, St. Paul, MN.* Continuing research and community engagement with the Nutrient Network and MSP LTER programs (see post-doctoral research below).

2020 – 2022 **Post-doctoral Research Scientist**, *Dr. Sarah Hobbie's Lab, Department of Ecology, Evolution and Behavior, University of Minnesota, St. Paul, MN.* Examined how nutrient addition and grazing patterns affect plant, soil, and decomposition dynamics in grasslands in collaboration with the Nutrient Network project. Explored spatial patterns of urban tree biodiversity and climate and social vulnerability across the Minneapolis-St. Paul (MSP) metro area as part of the new MSP Long-Term Ecological Research (LTER) program; established and fostered collaborations with local and regional agencies, municipalities, and community groups.

2012 – 2013 **Research Assistant**, *Dr. Bethany Bradley's Lab, Department of Environmental Conservation, University of Massachusetts Amherst, Amherst, MA.* Built database of georeferenced presence/absence data of invasive plant species across continental U.S to model predictions of invasive species distributions under future climates.

2008 – 2009 **Research Assistant**, *Dr. Paul Moorcroft's Lab, Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, MA.* Collated data and developed statistical models of dual infection rates of blister rust and mountain pine beetle in whitebark pine ecosystems. Assembled and analyzed data to build spatially explicit model of leafy spurge spread.

PEER-REVIEWED PUBLICATIONS

15. **Keller, A.B.,** Brandt, L.A., Cavender-Bares, J., Knight, J., and Hobbie, S.E. (2024). Tree diversity across the Minneapolis-St. Paul Metropolitan Area in relation to climate and social

vulnerability. *Ecological Applications.* DOI: 10.1002/eap.3034; https://esajournals.onlinelibrary.wiley.com/doi/10.1002/eap.3034

14. Nave, L.E., DeLyser, K., Domke, G.M., Holub, S.M., Janowiak, M.K., **Keller, A.B**., Peters, M.P., Solarik, K.A., Walters, B.F., and Swanston, C.W. (2024) Land use change and forest management effects on soil carbon stocks in the Northeast U.S. *Carbon Balance and Management.* DOI: 10.1186/s13021-024-00251-7; https://link.springer.com/article/10.1186/s13021-024-00251-7

13. **Keller, A.B.,** Walter, C.A., Blumenthal, D.M., Borer, E.T., Collins, S.L, DeLancey, L.C., Fay, P.A., Hofmockel, K.S., Knops, J.M.H., Leakey, A.D.B., Mayes, M., Seabloom, E.W., and Hobbie, S.E. (2022) Stronger fertilization effects on aboveground versus belowground plant properties across nine U.S. grasslands. *Ecology.* DOI: 10.1002/ecy.3891; https://esajournals.onlinelibrary.wiley.com/doi/10.1002/ecy.3891
News article about this work available here.

12. Klink, S., **Keller, A.B.**, Wild, A.W., Baumert, V.L., Gube, M., Lehndorff, E., Meyer, N., Mueller, C.W., Phillips, R.P., Pausch, J. (2022). Stable isotopes reveal that fungal residues contribute more to mineral-associated organic matter pools than plant residues. *Soil Biology and Biochemistry*. DOI: 10.1016/j.soilbio.2022.108634; https://www.sciencedirect.com/science/article/abs/pii/S0038071722000918

11. See, R.C., **Keller, A.B.**, Weber, P.K., Hobbie, S.E., Kennedy, P.G., Pett-Ridge, J. (2022). Hyphae move matter and microbes to mineral microsites: Integrating the hyphosphere into conceptual models of soil organic matter stabilization. *Global Change Biology*. DOI: 10.1111/gcb.16073; https://onlinelibrary.wiley.com/doi/10.1111/gcb.16073

10. **Keller, A.B.,** Borer, E.T., Collins, S.L, DeLancey, L.C., Fay, P.A., Hofmockel, K.S., Leakey, A.D.B., Mayers, M., Seabloom, E.W., Walter, C.A., Wang, Y., Zhao, Q., and Hobbie, S.E. (2021) Soil carbon stocks in temperate grasslands differ strongly across sites but are insensitive to decade-long fertilization. *Global Change Biology*. DOI: 10.1111/gcb.15988; https://onlinelibrary.wiley.com/doi/abs/10.1111/gcb.15988

9. Nagy, R.C. et al. (**Keller, A.B.** one of 120 coauthors). (2021) Harnessing the NEON data revolution to advance open environmental science with a diverse and data-capable community. *Ecosphere.* DOI: 10.1002/ecs2.3833; https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.3833

8. **Keller, A.B.**, Brzostek, E.R., Craig, M.E., Fisher, J.B., and Phillips, R.P. (2021) Root-derived inputs are major contributors to soil carbon in temperate forests. *Ecology Letters*. DOI: 10.1111/ele.13651; https://onlinelibrary.wiley.com/doi/abs/10.1111/ele.13651?af=R

7. **Keller, A.B.** and Limaye, V.S. (2020) Engaged Science: Strategies, Opportunities and Benefits. *Sustainability* 12(19). DOI: 10.3390/su12197854; https://www.mdpi.com/2071-1050/12/19/7854

6. **Keller, A.B.** and Phillips, R.P. (2019) Relationship between belowground carbon allocation and nitrogen uptake in saplings varies by plant mycorrhizal type. *Frontiers in Forests and Global Change*. 2:81 DOI: 10.3389/ffgc.2019.00081; https://www.frontiersin.org/articles/10.3389/ffgc.2019.00081/full

5. **Keller, A.B.** and Phillips, R.P. (2019) Leaf litter decay rates differ between mycorrhizal groups in temperate, but not tropical, forests. *New Phytologist*. DOI: 10.1111/nph.15524; https://nph.onlinelibrary.wiley.com/doi/10.1111/nph.15524

4. Zhang, H., Lü, X., Hartmann, H., **Keller, A.B,** Han, X., Trumbore, S., and R.P. Phillips. (2018) Foliar nutrient resorption differs between arbuscular mycorrhizal and ectomycorrhizal trees at local and global scales. *Global Ecology and Biogeography*. 1:11 DOI: 10.11K11/geb.12738; https://onlinelibrary.wiley.com/doi/abs/10.1111/geb.12738

3. Waring B.G., Álvarez-Cansino, L., Barry, K.E., Becklund, K.K., Dale, S., Gei, M.G., **Keller, A.B.**, Lopez, O.R, Markesteijn, L., Mangan, S., Rigs, C.E., Rodríguez-Ronderos, M.E., Segnitz, R.M., Schnitzer, S.A., Powers, J.S. (2015) Pervasive and strong effects of plants on soil chemistry: a meta-analysis of individual plant 'Zinke' effects. *Proc. R. Soc. B*. 282: 20151001; https://royalsocietypublishing.org/doi/full/10.1098/rspb.2015.1001

2. Cleveland, C.C., Reed, S.C., **Keller, A.B.**, Nemergut, D.R., Sean P.O., Ostertag, R., Vitousek, P.M. (2014) Litter quality versus microbial community controls over decomposition: a quantitative analysis. *Oecologia*. DOI: 10.1007/s00442-013-2758-9;

1. **Keller, A.B**., Reed, S.C., Townsend, A.R., Cleveland, C.C. (2013) Effects of canopy tree species on belowground biogeochemistry in a lowland wet tropical forest. *Soil Biology and Biochemistry*. 58:61-69; https://www.sciencedirect.com/science/article/abs/pii/S003807171200421X

In review:

Keller, A.B., and Phillips, R.P. (*in review*). Integrating theories of local scale carbon and nitrogen cycling: the '*tree*' versus '*soil*' perspective. *Submitted to Oecologia.*

Nave, L., DeLyser, K., Domke, G.M., Holub, S.M., Kabrick, J.M., **Keller, A.B.**, Leopold, P., Solarik, K.A., and Swanston, C.W. *(in review*). Land use change and forest management

effects on soil carbon stocks in the Central Hardwoods, U.S. *Submitted to Forest Ecology and Management*.

SELECTED SCIENCE DELIVERY & COMMUNITY ENGAGEMENT ACTIVITIES

2024 **Technical primers for land managers.** *Northern Institute of Applied Climate Science.* Published a series of four topical primers that synthesize current research related to 1) Fire effects on ecosystem carbon 2) Earthworm effects on ecosystem function and carbon cycling 3) Soil carbon cycling and 4) Wetland carbon cycling. Available here.

2023 – **Forest carbon science and management in the eastern U.S.** *Northern Institute of Applied Climate Science.* Develop and deliver presentations to land managers on the fundamentals of forest carbon cycling and how management practices affect forest carbon.

2022 – **Climate adaptation and mitigation workshops for land managers**, *Northern Institute of Applied Climate Science.* Co-develop and lead workshops for land managers on how to consider climate adaptation and mitigation in management plans. See example project here (local media coverage here).

2023 **Trees and the city data nugget**, MSP LTER. Developed new K-12 curriculum based on urban tree biodiversity research. Available here.

2018 **Science and Democracy Fellowship**, *Union of Concerned Scientists.* Developed and led science communication and advocacy workshops. Organized local community around science advocacy initiatives. Participated in COMPASS science communication week-long workshop. Collaborated on two-part blog post reflecting on fellowship experience here and here.

2019 **A Science-Faith Dialogue in the Indiana Heartland**, *Bloomington, Indiana.* Collaborated with a senior faculty member and several religious leaders in the community to organize a 3-part community discussion center on Creation Care and climate advocacy. Final report available here.

2018 **Co-authored NRDC blog post with Dr. Vijay Limaye**; "Engaged Science: 6 Tips for the Trump Era": https://www.nrdc.org/experts/vijay-limaye/engaged-science-6-tips-trump-era

2017 – 2020 **Concerned Scientists @ Indiana University** (CSIU; a campus-community science advocacy organization), Steering Committee Member. Organized public events, developed and led workshops, and elevated civic engagement related to science advocacy. Founder of **Advocates for Science @ Indiana University**, the IU student organization arm of CSIU.

2016 – 2020 **ScIU Blog Writer**, Indiana U. College of Arts and Sciences blog (https://blogs.iu.edu/sciu/)

2016 – 2020 **Group Scholars STEM Mentoring Program Mentor**, Indiana University

2016 **Jim Holland Summer Science Research Program Mentor**, Indiana University. Mentored a high school student from underrepresented population to develop an independent research project.

2015 – 2016 **EcoLunch Committee Co-chair**, Indiana University; Organized research and professional development seminar series, spearheaded efforts to strengthen ecology group at IU

COMPETITIVE GRANTS, AWARDS, AND FELLOWSHIPS (total awarded: $172,695)

2019 USDA NIFA Pre-doctoral Fellowship, "Getting to the root of tree-mycorrhizal effects on carbon and nitrogen cycling in temperate forests" ($119,985)

2019 Floyd/Ogg/Cleland Final Year Fellowship, Indiana University ($10,833, declined)

2019 AAAS DoSER Public Engagement Award, "A Science-Faith Dialogue in the Indiana Heartland" ($1,000)

2018, 2019 Provost's Travel Award for Women in Science, Indiana University ($1,000)

2018 Science and Democracy Fellowship, Union of Concerned Scientists ($5,500)
(6-month fellowship focused on leading local science communication and advocacy initiatives)

2018 McCormick Science Grant, Indiana University ($2,500)
(Awarded to IU College of Arts and Sciences graduate student member of faculty/graduate student team whose research is judged most creative, visionary, and innovative)

2018 Blatchley Nature Study Club Scholarship, Indiana University ($500)
(Communicated my research in a non-technical presentation to Nature Club members)

2017 CTFS-ForestGEO Research Grants Program, "A tree's perspective of forest nutrient cycling: linking above- and belowground tree nutrient strategies" ($14,977)

2017 Student Research Grant, Indiana University Research and Teaching Preserve ($2,000)

2017 Louise Constable Hoover Fellowship, Department of Biology, Indiana University ($1500)

2016 Fred Seward Award, Department of Biology, Indiana University ($2,000)

2015 – 2018 Floyd Plant Summer Fellowship, Indiana University ($1,600 each year)

2011 Best Student Presentation, Ecological Society of America Soil Ecology Section

2011 George E. Bright Memorial Scholarship, College of Forestry, University of Montana ($3,000)

2010 NSF Graduate Research Fellowship Honorable Mention

2010 Edward F. Barry Scholarship, College of Forestry, University of Montana ($1,500)

2010 Outstanding Presenter Award, U. of Montana Graduate/Faculty Research Conference

2006 William R. Angell Foundation Prize in Biology, Macalester College

TEACHING EXPERIENCE

2021 **Assistant Professor**, *Student Diplomacy Corps.* Developed and taught intensive 6-week college-level course "Biogeography: The Science and Art of Observation" to diverse group of first-generation college students. Supervised and mentored teaching assistant.

2017-2019 **Fellow**, *Graduate Women in STEM Teaching Fellows Program, Indiana University*

2014 – 2019 **Associate Instructor**, *Dept. of Biology, Indiana University, Bloomington, IN.* Taught Introductory Biology lecture (L111) and lab/discussion course (L113), and Field Ecology (L474) for undergraduate science majors.

2013 **Field Ecology Instructor**, *Ecology Project International, Puerto Ayora, Galápagos Islands, Ecuador.* Taught intensive 5-10 day ecology field courses with U.S. and Ecuadorian students in English and Spanish.

2008 – 2009 **Science Teacher**, *Science from Scientists, Boston, MA.* Developed and taught hands-on science modules to public school students

2006 – 2014 **Group Leader**, *Experiment in International Living/Student Diplomacy Corps, Brattleboro, VT*
Led high-school cross-cultural study abroad programs in Botswana, South Africa, Australia, and Mexico. Facilitated home-stay experiences, academic programming, community service and in-country logistics.

Mentoring in research

2015 – **Undergraduate Research Mentor**, Mentees: Corben Andrews, Madison Barney, Andrea Bloom, Daniel Boyes, Lily Bunis-Haines, Megan Du, Daniel Du, Kelly Fox*, Jordan Gregory, Emma Hand, Jaema Howard, Alicia Mehling, Kelsey Nicholson, James Keys, Hongxi Lyu*, Michaela Lock, Brindin Parrott, Elizabeth Parent, Grace Prince, Naomi Reibold, Shelby Roberts*, Caleb Smith*, Rachel Zeunik
* *indicates students I supervised who carried out independent research projects*

RELEVANT TRAINING AND SKILLS

Leadership Development Program (2022), University of Minnesota

Inclusive Science Education Fellow (2021), University of Minnesota

Proficient in R programming, GIS, GitHub, Adobe and MS applications

Proficient in written and oral Spanish; experienced in cross-cultural communication and competency

PROFESSIONAL SERVICE

University service: member of Diversity and Inclusion Committee, College of Forest Resources and Environmental Science (2024 – Present)

Journal reviewer: Biogeochemistry, Ecology, Ecosystems, Global Biogeochemical Cycles, Global Change Biology, Journal of Ecology, New Phytologist, Plant and Soil, Proceedings of the National Academies of Science (PNAS), Science of the Total Environment, Soil Biology and Biochemistry

Technical reviewer: Northwoods Magazine

Proposal reviewer: Midwest Climate Adaptation Center, University of Vermont McIntire Stennis

SELECTED PRESENTATIONS

Keller, A.B. Fire effects on ecosystem carbon in the Midwest and Eastern United States. October 2024. **Oak Woodlands & Forests Fire Consortium Webinar Series.** (Invited)

Keller, A.B., Calhoun, A., Handler, S., Janowiak, M., Littlefield, C., and Miner, B. Managing for multiple goals in a changing climate: a framework for qualitatively assessing trade-offs and co-benefits at local scales. **2024 North American Forest Ecology Workshop**

Keller, A.B. Forest carbon cycling and implications for county forest management. Oral Presentation. **2024 Wisconsin County Forests Association.** (Invited)

Keller, A.B., Grimm, M., Handler, S., Janowiak, M., Miner, B., and Ontl, T. Climate-informed restoration in non-forest habitats: resources for adaptation, mitigation, and biodiversity goals. Oral Presentation. **2022 National Adaptation Forum.**

Keller, A.B. How roots and their associated mycorrhizal fungi drive soil carbon and nitrogen cycling in forests. October 2022. Seminar for **Wuhan Botanical Garden, Chinese Academy of Sciences.** (Invited)

Keller, A.B., Brandt, L., Cavender-Bares, J., Knight, J., and Hobbie, S.E. How urban tree canopy biodiversity relates to climate and social vulnerability across the Twin Cities. Oral Presentation. **2022 Shade Tree Short Course.** (Invited)

Keller, A.B., Borer, E.T., Collins, S.L., DeLancey, L.C., Fay, P.A., Hofmockel, K.S., Leakey, A.D.B., Mayes, M.A., Seabloom, E.W., Wang, Y., Zhao, Q., and Hobbie, S.E. Site reigns supreme across temperate grasslands: plant and soil carbon stocks vary widely across sites but are relatively insensitive to decade-long fertilization. Oral Presentation, **2021 American Geophysical Union Fall Meeting,** New Orleans, LA

Keller, A.B., and Hobbie, S.E. Urban nature across the Minneapolis-St. Paul Metro Region: documenting the past and preparing for the future. Oral Presentation **2021 Minnesota Association of Professional Soil Scientists.** (Invited)

Keller, A.B., Brozstek, E.R., Craig, M.E., and Phillips, R.P. Plant and mycorrhizal trait effects on soil carbon dynamics across six temperate forests. Oral Presentation, **2019 American Geophysical Union Fall Meeting**, San Francisco, CA

Keller, A.B., and Limaye, V.S. Engaged science: strategies, opportunities, and benefits. Oral Presentation, **2019 American Geophysical Union Fall Meeting**, San Francisco, CA

Keller, A.B., Brzostek, E.R., and Phillips, R.P. Looking belowground: how belowground carbon allocation varies among AM and ECM species in eastern U.S. temperate forests. Oral Presentation, **2019 Ecological Society of America Meeting**, Louisville, KY

Keller, A.B. and Phillips, R.P. A tree's perspective of nutrient cycling: linking above- and below-ground nutrient use strategies. Oral Presentation, **2018 Ecological Society of America Meeting**, New Orleans, LA

Keller, A.B. and Phillips, R.P. Tree mycorrhizal association predicts leaf litter decomposition rates across temperate forests. Oral Presentation, **2017 Ecological Society of America Meeting**, Portland, OR

Keller, A.B. and Phillips, R.P. The carbon cost of nitrogen uptake: does mycorrhizal association predict rhizosphere carbon and nitrogen dynamics? Poster Presentation, **2016 Ecological Society of America Meeting**, Fort Lauderdale, FL

Keller, A.B. Reed, S.C., Townsend, A.R., Cleveland, C.C. Effects of canopy tree species on belowground biogeochemistry in a lowland wet tropical forest. Oral Presentation, **2011 Ecological Society of America Meeting**, Austin, TX

Cleveland, C.C., Reed, S.C., **Keller, A.B.** Does soil microbial community composition affect decomposition rates? Oral Presentation, **2010 University of Montana Graduate/Faculty Research Conference**, Missoula, MT

REFERENCES AVAILABLE UPON REQUEST