

WENDY H. YANG

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EDUCATION

Harvard University	Environmental Science & Public Policy	B.A., 2003
University of California, Berkeley	Environmental Science, Policy & Management	Ph.D., 2010

APPOINTMENTS

Affiliate, Center for Digital Agriculture, UIUC	2020 –
Associate Professor, Departments of Plant Biology and Geology, UIUC	2019 –
Affiliate, Institute for Genomic Biology, Genomic Ecology of Global Change, UIUC	2019 –
Affiliate, Institute for Genomic Biology, Center for Advanced Bioenergy and Bioproducts Innovation, UIUC	2017 –
Affiliate, Institute for Sustainability, Energy and Environment, UIUC	2015 –
Affiliate, Program in Ecology, Evolution, and Conservation Biology, UIUC	2014 –
Assistant Professor, Departments of Plant Biology and Geology, UIUC	2013 – 2019
Post-Doctoral Scholar, University of California, Berkeley	2010 – 2013

SELECTED FELLOWSHIPS & AWARDS

- UIUC College of Liberal Arts & Sciences, I.C. Gunsalus Scholar, 2019-2020
- Ecological Society of America, Early Career Fellow, 2018-2022
- *Global Biogeochemical Cycles* Top 20 Downloaded Papers in 2017-2018
- UIUC List of Teachers Ranked As Excellent By Their Students, *Ecosystem Ecology*, Fall 2017, 2019
- *Biogeochemistry* "Excellence in Reviewing" Award for the top 25 reviewers, 2017
- UIUC College of Liberal Arts & Sciences, Lincoln Excellence for Assistant Professors (LEAP) Award, 2017-2019
- UIUC School of Integrative Biology (SIB), Joseph B. Hawkes Award, 2015-2016
- National Great Rivers Research and Education Center Faculty Fellow, 2014-2015
- National Science Foundation Doctoral Dissertation Improvement Grant, 2008
- National Science Foundation, Graduate Research Fellowship, 2007-2010 (Awarded 2006)
- Department of Energy, Global Change Education Program, Graduate Research Environmental Fellowship, 2006-2007 (declined two additional years of funding)

RESEARCH PROGRAM

The structure and function of ecosystems are changing due to pressures from external forcing such as climate change, anthropogenic nitrogen deposition, and species invasion. Through my research I strive to improve our understanding of plant, microbial and soil dynamics to better predict, adapt to, and mitigate the effects of these global environmental changes. My research focuses on the mechanisms driving patterns in greenhouse gas emissions and rates of chemical transformations in the environment. As a global change ecologist and stable isotope biogeochemist, I use a combination of observational and experimental studies in the field and laboratory settings to study both natural and managed ecosystems. My research program at the University of Illinois at Urbana-Champaign includes projects within two major themes: Controls on Redox-Sensitive Biogeochemical Processes, and Plant Community Composition Effects on Biogeochemical Processes. Specific projects include:

- Effects of Rainfall Intensification on Soil Greenhouse Gas Emissions in the Midwest
- Controls on Dissimilatory Nitrate Reduction to Ammonium in Upland Soils
- Iron-mediated Biogeochemistry in Terrestrial Ecosystems
- Woody Polycultures as a Transformative Solution to Sustainable Agriculture
- Mycorrhizal Mediation of Forest Nutrient and Carbon Cycling
- Invasive Species Effects on Ecosystem Nitrogen Dynamics
- Plant-Soil-Microbe Interactions in Bioenergy Cropping Systems

FUNDED RESEARCH

- Managing the maize microbiome for sustainable nutrient retention in Illinois agricultural soils*, 2020-2022, \$253,664. Illinois Nutrient Research and Education Council (Co-PI with Kent A as Lead PI)
- Integration of novel wireless in-field sensors and machine learning for smart precision agriculture*, 2020-2021, \$50,000. UIUC Center for Digital Agriculture seed grant (Co-PI with Lu Y as Lead PI)
- Mining ancient genomes for mechanisms to improve nutrient retention in maize agroecosystems*, 2020-2024, \$750,000. USDA NIFA Agricultural Microbiomes Program Area (Co-PI with Kent A as Lead PI)
- Novel probe of oxygen and its isotopes for millimeter-scale measurements of soil dynamics*, 2020-2021, \$1,500,000 (\$224,646 Aerodyne subcontract to UIUC). DOE Small Business Innovation Research Phase II (Shorter J as Lead I)
- Novel probe of oxygen and its isotopes for millimeter-scale measurements of soil dynamics*, 2019, \$225,000 (\$17,394 Aerodyne subcontract to UIUC). DOE Small Business Innovation Research Phase I (Shorter J as Lead I)
- Dimensions: Collaborative Research: The role of microbial biodiversity in controlling nitrous oxide emissions from soils*, 2018-2023, \$1,988,881 (\$691,453 to UIUC). NSF Dimension of Biodiversity (UIUC Lead PI with Konstantindis K as overall Lead PI)
- Towards management of dissimilatory nitrate reduction to ammonium for nitrate retention in agricultural soils*, 2018-2021. \$475,353. Illinois Nutrient Research and Education Council (Co-PI with Kent A as Lead PI)
- Unraveling the paradox of dissimilatory nitrate reduction to ammonium in upland soils*, 2017-2019. \$150,000. NSF (Lead PI)
- Center for Advanced Bioenergy and Bioproducts Innovation*, \$115,000,000 (\$3,057,073 to Yang). 2017-2022. DOE (Co-I with DeLucia E as Lead I)
- Transforming the Midwest U.S. with woody polycultures for food production and ecosystem service enhancement*, 2017-2020. \$495,000. USDA NIFA (Lead PD)
- Garlic mustard (*Alliaria petiolata*) -- a "triple-threat" to forest health* 2017-2019. \$72,820. USDA NIFA (Senior Personnel with Yannarell A as Lead PD)
- Dissimilatory nitrate reduction to ammonium: An unexplored microbial pathway for nitrate retention in agricultural soils*, 2016-2018. \$100,000. USDA NIFA (Lead PD)
- Exploring the importance of iron redox cycling in driving biogeochemical processes in terrestrial ecosystems*, 2016-2018. \$20,405. UIUC Campus Research Board (Sole PI)
- Dissimilatory nitrate reduction to ammonium: An unexplored microbial pathway for nitrate retention in agricultural soils*, 2016-2017. \$124,645. Illinois Nutrient Research and Education Council (Co-PI with Kent A as Lead PI)
- Assessing controls on soil carbon storage as an ecosystem service provided by woody polyculture systems*. \$9,976. 2015-2016. UIUC School of Integrative Biology Joseph B. Hawkes Award. (Sole PI)
- Trait-based nutrient limitation: Drivers of belowground carbon and nitrogen cycling response to nitrogen deposition in a tropical montane forest*. \$27,450. 2014-2015. UIUC Campus Research Board (Sole PI)
- Multifunctional woody polyculture for sustainable food production*. \$500,000. 2014-2017. UIUC Institute for Sustainability, Energy, and Environment (Co-PI with Lovell ST as Lead PI)

PUBLICATIONS (*denotes directly supervised postdoc; † denotes directly supervised graduate student; ¥ denotes directly supervised undergraduate student)

37. Dove NC, Arogyaswamy K, Billings SA, Bothoff JK, Carey CJ, † Cisco C, DeForest JL, Fairbanks D,

- Fierer N, Kaye JP, Lohse KA, Maltz MR, Mayora E, Pett-Ridge J, **Yang WH**, Hart SC, Aronson EL (2020) Continental-scale patterns of extracellular enzyme activity in the subsoil: an overlooked reservoir of microbial activity. In Press, *Environmental Research Letters*
36. Moore CE, Berardi D, Betes-Blanc E, DeLucia EH, Dracup EC, † Egenriether S, Gomez-Casanovas N, Hartman M, Hudiburg T, Kantola I, Masters M, Parton W, Van Allen R, *von Haden A, **Yang WH**, Bernacchi CJ (2020) The carbon and nitrogen cycle impacts of reverting perennial switchgrass to an annual maize crop rotation. In Press, *Global Change Biology-Bioenergy*
35. Zeri M, **Yang WH**, Cunha-Zeri G, Gibson C, Bernacchi C (2020) Nitrous oxide fluxes over establishing biofuel crops: characterization of temporal variability using cross-wavelet analysis. *Global Change Biology-Bioenergy*, 12, 756-770.
34. Paul RF, Cai Y, Peng B, **Yang WH**, Guan K, DeLucia EH (2020) Spatiotemporal derivation of intermittent ponding in a maize-soybean landscape from Planet Labs CubeSat images. *Remote Sensing*, 12, Article 1942.
33. *von Haden AC, **Yang WH**, DeLucia EH (2020) Soils' dirty little secret: Depth-based comparisons can be inadequate for quantifying changes in soil organic carbon and other mineral soil properties. *Global Change Biology*, 26, 3759-3770.
32. Chee-Sanford JC, Connor L, † Krichels A, **Yang WH**, Sanford RA (2020) Hierarchical detection of diverse Clade II (atypical) *nosZ* genes using new primer sets for classical- and multiplex PCR array applications. *Journal of Microbiological Methods*, 172, Article 105908.
31. Heath KD, Podowski JC, Heniff S, Klinger CR, Burke PV, Weese DJ, **Yang WH**, Lau JA (2020) Light availability and rhizobium variation interactively mediate the outcomes of legume-rhizobium symbiosis. *American Journal of Botany*, 107, 229-238.
30. Almaraz M, Wong M, **Yang WH** (2020) Looking back to look ahead: A vision for soil denitrification research. *Ecology*, 101, Article e02917.
29. ¥ Suriyavirun N, † Krichels AH, Kent AD, **Yang WH** (2019) Microtopographic differences in soil properties and microbial community composition at the field scale. *Soil Biology & Biochemistry*, 131, 71-80.
28. ¥ Portier EF, Silver WL, **Yang WH** (2019) Effects of an invasive perennial forb on gross soil nitrogen cycling and nitrous oxide fluxes depend on phenology. *Ecology*, 100, e02716.
27. ¥ Cannon J, Sanford R, Connor L, **Yang WH**, Chee-Sanford J (2019) Sequence alignments and validation of PCR primers used to detect phylogenetically diverse *nr1A* genes associated with dissimilatory nitrate reduction to ammonium (DNRA). *Data in Brief*, 25, Article 104016.
26. ¥ Cannon J, Sanford R, Connor L, **Yang WH**, Chee-Sanford J (2019) Optimization of PCR primers to detect phylogenetically diverse *nr1A* genes associated with nitrite ammonification. *Journal of Microbiological Methods*, 160, 49-59.
25. † Krichels AH, ¥ Sipic E, **Yang WH** (2019) Iron redox reactions can drive microtopographic variation in upland soil carbon dioxide and nitrous oxide emissions. *Soil Systems*, 3, 60
24. † Krichels AH and **Yang WH** (2019) Dynamic controls on field-scale soil nitrous oxide hot spots and hot moments across a microtopographic gradient. *Journal of Geophysical Research-Biogeosciences*, 124, 3618-3634.
23. † Krichels AH, DeLucia EH, Sanford R, Chee-Sanford J, **Yang WH** (2019) Historical soil drainage mediates the response of soil greenhouse gas emissions to intense precipitation events. *Biogeochemistry*, 142, 425-442.
22. Orellana LH, Hatt JK, Chourey K, Hettich RL, **Yang WH**, Chee-Sanford JC, Sanford RA, Löffler FE, and Konstantinidis KT (2019) Comparing DNA, RNA and protein levels for measuring microbial dynamics in soil microcosms amended with nitrogen fertilizer. *Scientific Reports*, 9, 17630.
21. Brewer T, Aronson EL, Arogyaswamy K, Billings SA, Botthoff JK, Campbell AN, Dove NC, Fairbanks D, Gallery RE, Hart SC, Kaye JP, King GM, Lohse KA, Maltz MR, Mayorga E, O'Neill

- C, Owens SM, Packman AI, Pett-Ridge J, Plante AF, Richter DD, Silver WL, **Yang WH**, Fierer N (2019) Ecological and genomic attributes of novel bacterial taxa that thrive in subsurface soil horizons. *mBio*, 10, e01318-19.
20. Shan J, Chen S, Chee-Sanford JC, **Yang WH**, Sanford RA, Chen J, Yan X (2019) Impact of triclosan and triclocarban on denitrification and N₂O emissions in paddy soil. *Science of the Total Environment*, 695, Article 133782.
 19. Hanisch PE, Drager K, **Yang WH**, Tubaro P, Suarez AV (2019) Intra- and inter-specific variation in trophic ecology of “predatory” ants in the subfamily Ponerinae. *Ecological Entomology*, doi/10.1111/een.12817
 18. ¥ Edwards J, Pittelkow C, Kent A, **Yang WH** (2018) Dynamic biochar effects on soil nitrous oxide emissions and underlying microbial processes during the maize growing season. *Soil Biology & Biochemistry*, 122, 81-90.
 17. Wolz K, Lovell ST, Branham B, Eddy WC, Keeley K, Revord R, Wander W, **Yang WH**, DeLucia E (2018) Frontiers in alley cropping: transformative solutions for temperate agriculture. *Global Change Biology*, Article GCB13986.
 16. **Yang WH**, Ryals RA, Cusack DF, Silver WL (2017) Cross-biome assessment of gross soil nitrogen cycling in California ecosystems. *Soil Biology & Biochemistry*, 107, 144-155.
 15. **Yang WH**, McNicol G, Teh, YA, Wood, TE, Estera-Molina, K, Silver, WL (2017) Evaluating the classical versus an emerging conceptual model of peatland methane dynamics. *Global Biogeochemical Cycles*, 31, 1435-1453.
 14. **Yang WH**, Silver WL (2016) Gross nitrous oxide production drives net nitrous oxide fluxes across a salt marsh landscape. *Global Change Biology*, 22, 2228-2237.
 13. **Yang WH**, Silver WL (2016) Net soil-atmosphere fluxes mask gross production and consumption of nitrous oxide and methane in a managed ecosystem. *Biogeosciences*, 13, 1705-1715.
 12. **Yang WH**, Liptzin D (2015) High potential for iron reduction in upland soils. *Ecology*, 96, 2015-2020.
 11. **Yang WH**, Traut BH, Silver WL (2015) Microbially mediated nitrogen retention and loss in a salt marsh soil. *Ecosphere*, 6. <http://dx.doi.org/10.1890/ES14-00179.1>
 10. **Yang WH**, McDowell AC, Brooks PD, Silver WL (2014) New high precision approach for measuring ¹⁵N-N₂ gas fluxes from terrestrial ecosystems. *Soil Biology and Biochemistry*, 69, 234-241.
 9. **Yang WH**, Teh YA, Silver WL (2013) Measuring gross N₂O production in soil: a reply to Well and Butterbach-Bahl. *Global Change Biology*, 19, 985-987.
 8. **Yang WH**, Weber KA, Silver WL (2012) Nitrogen loss from soil through anaerobic ammonium oxidation coupled to iron reduction. *Nature Geoscience*, 5, 538-541.
 7. **Yan, WH**, Silver WL (2012) Application of the N₂/Ar technique to measuring soil-atmosphere N₂ fluxes. *Rapid Communications in Mass Spectrometry*, 26, 1-11.
 6. **Yang WH**, Herman DJ, Liptzin D, Silver WL (2012) A new approach for removing iron interference from soil nitrate analysis. *Soil Biology and Biochemistry*, 46, 123-128.
 5. **Yang WH**, Teh YA, Silver WL (2011) A test of a field-based ¹⁵N-nitrous oxide pool dilution technique to measure gross N₂O production in soil. *Global Change Biology*, 17, 3577-3588.
 4. Burgin AM, **Yang WH**, Silver WL, Hamilton S (2011) Beyond C and N: How the microbial energy economy couples elemental cycles in diverse ecosystems. *Frontiers in Ecology and the Environment*, 9, 44-52.
 3. Cusack DF, Chou WW, **Yang WH**, Harmon ME, Silver WL, the LIDET Team (2009) Controls on long-term root and leaf litter decomposition in neotropical forests. *Global Change Biology*, 15, 1339-1355.
 2. Sack L, Melcher P, **Liu WH**, Middleton E, Pardee T (2006) How strong is intra-canopy leaf plasticity in temperate deciduous trees? *American Journal of Botany*, 93, 829-839.
 1. **Liu WH**, Bryant DM, Hutrya LR, Saleska SR, Hammond Pyle E, Curran DC, Wofsy SC

(2006) Woody debris contribution to the carbon budgets of selectively-logged and maturing mid-latitude forests. *Oecologia*, 148, 108-117.

SYNERGISTIC ACTIVITIES

- **Mentor undergraduates in research**, including (1) more than 50 students at UIUC—four of whom completed independent projects that contributed to peer-reviewed publications and nine who are now in STEM graduate programs; and (2) through leading iBio: Introduction to Research in Integrative Biology, 10-week professional development program that complements and enhances summer independent research experiences for undergraduates.
- **Educate high school students** through the development of a new short course, titled “Exploring Life Beneath Our Feet,” for the 4-H Summer Academy run by the University of Illinois Extension. This 3-day course, which debuted in 2018, provides a hands-on experience in soil biology for up to 20 students. In 2016, the Academy reached 306 Illinois high schoolers, including 26 % from under-represented minorities and 25 % from rural areas.
- **Engage with farmers**, through (1) the Savanna Institute’s Annual Perennial Farmer Meeting, (2) annual Field Days hosted at our research sites, (3) the University of Illinois Extension, and (4) the website, www.perennialmap.org. Farmer outreach is a critical component of my research program related to investigating woody polycultures as a sustainable agricultural system in the Midwest. Our research questions were developed through interactions with farmers and with the Savanna Institute, a non-profit organization dedicated to developing perennial farming practices in the Midwest through research, education, and outreach. We have funding from the USDA to conduct experiments on working farms throughout the Midwest and to build a virtual community of perennial farmers and researchers through the Perennial Map website. Since 2017, I have also served on the Savanna Institute's Advisory Board.
- **Develop innovative curricula** at both undergraduate and graduate levels:
 - *Biology in Today's World* (non-majors online course, IB 100, at UIUC in 2016-2019): Revamped existing course to frame within current issues, incorporate innovative teaching techniques, increase instructional opportunities for the teaching assistants, and improve efficiencies in running a large online course (300-400 students).
 - *Ecosystem Ecology* (upper division undergraduate and graduate course, IB 452, at UIUC in 2017, 2019): Incorporated flipped classroom and active learning techniques in an innovative flexible teaching classroom designed to facilitate in-class group work
 - *Stable Isotope Ecology and Biogeochemistry* (upper division undergraduate and graduate course, IB 488, at UIUC in 2015; graduate seminar, ESPM 298, at UC-Berkeley in 2011): In semester-long courses, trained students in both the theory and practical application of stable isotope techniques. Each student completed a project to gain experience in designing stable isotope experiments, processing and analyzing samples, and processing, analyzing, and interpreting data.
- **Organize oral sessions** related to my research areas at national scientific conferences:
 - “Iron: A Catalyst for Redox-driven Biogeochemical Cycling in Terrestrial Ecosystems”, ESA 97th Annual Meeting, 2012.
 - “Iron: A Catalyst for Biogeochemical Processes in Terrestrial and Extreme Ecosystems”, American Geophysical Union Fall Meeting, 2014.
 - “Novel Agroecosystems: Using Biodiversity to Enhance Food Production and Ecosystem Services in Perennial Polycultures”, ESA 101st Annual Meeting, 2016.

- Inspire (Ignite-style) Session on "Developing a unifying framework for understanding controls on denitrification in terrestrial ecosystems", Ecological Society of America 103st Annual Meeting, 2018. New Orleans, LA.
- **Served on Editorial Advisory Board** for *Global Change Biology*, 2014-2016
- **Peer review for** state and federal funding agencies (ad hoc and *panels), including *Department of Energy, Leopold Center for Sustainable Agriculture at Iowa State University, Maryland Sea Grant, *National Science Foundation, Ohio Water Resources Center, *U.S. Department of Agriculture