



Exponent®
Engineering & Scientific Consulting

Lauren Breza, Ph.D.

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Professional Profile

Dr. Lauren Breza is a soil scientist with expertise in biogeochemistry, carbon cycling, nutrient retention, and soil ecology. Her work focuses on the impacts of anthropogenic land-use change, particularly agricultural management practices that influence soil biogeochemistry. She integrates field experimentation with quantitative and statistical analyses to evaluate how management practices affect soil health and environmental outcomes such as ecosystem resilience. Dr. Breza has published on organic and inorganic nitrogen cycling, carbon stock distribution, ecosystem genetics, invasive species, and the broader effects of management on soil and ecosystem function. Her interdisciplinary background bridges soil science, ecology, and environmental science, enabling her to translate complex biogeochemical processes into practical strategies for land management and sustainability.

Dr. Breza earned her Ph.D. in Earth and Environmental Science from the University of New Hampshire, where she investigated the fate and transport of nitrogen in response to soil amendments using stable isotope techniques. Before joining Exponent, she conducted postdoctoral research with the USDA Agricultural Research Service (ARS), collaborating with farmers, product distributors, researchers, and Extension specialists to address agricultural challenges. Dr. Breza's past research spans multiple spatial scales, from examining the impacts of subsurface drainage on regional carbon stocks to elucidating biochemical pathways that influence nutrient persistence in soil. Her subsurface drainage research has led to invited talks where she contributed to discussions on conservation drainage practices and water management strategies. Dr. Breza's work provides a mechanistic foundation for understanding how management practices alter biogeochemical processes and their cascading consequences for long-term soil function, ecosystem stability, and agricultural sustainability.

Dr. Breza is proficient in experimental design, advanced statistical modeling (including mixed effects modeling, multivariate analyses, generalized additive models, meta-analyses), and laboratory methods for analyzing physical, chemical, and biological characteristics of soil. She is skilled in GC-MS analyses, isotope assays, greenhouse gas measurements, microbial enzyme and biomass assays, DNA extraction and quantification, and a broad range of soil physical and chemical analyses.

Academic Credentials & Professional Honors

Ph.D., Earth and Environmental Science, University of New Hampshire, 2021

M.S., Ecology and Evolutionary Biology, University of Tennessee, Knoxville, 2015

B.S., Ecology and Evolutionary Biology, University of Tennessee, Knoxville, 2011

USDA National Institute of Food and Agriculture Postdoctoral Fellow (2024-2025)

National Science Foundation, Graduate Research Fellow (2013-2018)

Prior Experience

Research Soil Scientist, USDA ARS, 2022-2025

Professional Affiliations

2024 – Soil Ecology Society

2019 – Soil Science Society of America

2017 – Ecological Society of America

Publications

Breza LC, Grandy AS. Organic amendments tighten nitrogen cycling in agricultural soils: a meta-analysis on gross nitrogen flux. *Frontiers in Agronomy* 2025; 7:1472749. DOI: 10.3389/fagro.2025.1472749

Breza LC, Moore JM, Tomasek A, Trippe KM. Soil carbon stocks response to subsurface drainage in the North Willamette Valley. *Seed Production Research at Oregon State University* 2024; 2024:11-14

Breza LC, Mooshammer M, Bowles TM, Jin VL, Schmer M, Grandy AS. Complex crop rotations improve organic nitrogen cycling. *Soil Biology and Biochemistry* 2023; 177:108911. DOI: 10.1016/j.soilbio.2022.108911

Breza LC, Moore JM, Tomasek A, Trippe KM. The effect of subsurface drainage in grass seed fields on soil carbon stocks. *Seed Production Research at Oregon State University* 2022; 2022:15-19.

Mueller LO, Breza LC, Genung MA, Giardina C, Stone NE, Sidak-Loftis LC, Busch JD, Wagner DM, Bailey JK, Schweitzer JA. Ecosystem consequences of plant genetic divergence with colonization of new habitat. *Ecosphere* 2017. DOI: 10.1002/ecs2.1743

Breza LC, Souza L, Sanders NJ, Classen AT. Within and between population variation in plant traits predict ecosystem functions associated with a dominant plant species. *Ecology and Evolution* 2012. DOI: 10.1002/ece3.223

Kuebbing S, Rodriguez-Cabal MA, Fowler D, Breza LC, Schweitzer JA, Bailey JK. Resource availability and plant diversity explain patterns of invasion of an exotic grass. *Journal of Plant, Ecology* 2012. DOI: 10.1093/jpe/rts018

Select Presentations and Invited Talks

Breza LC. The lifecycle of an ARS postdoc project. Invited talk, ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX, USA. 2025.

Breza LC, Moore J, Tomasek A, Trippe K. Artificial drainage does not impact total carbon stocks, but why? Soil Ecology Society Biannual Meeting, Grand Rapids, MI, USA, 2024.

Breza LC, Moore J, Tomasek A, Trippe K. Soil carbon and drainage: competing hypotheses. Invited talk, Conservation Drainage Network Annual Meeting, Columbus, OH, USA. 2024.

Breza LC. Tile drainage systems and soil carbon stocks: insights from the Willamette Valley. Invited talk, Oregon State University Extension, 2023.

Breza LC, Moore J, Tomasek A, Trippe K. Exploring the link between tile drainage systems and soil carbon stocks: insights from the Willamette Valley. ASA, CSSA, SSSA, International Annual Meeting, St. Louis, MO, USA. 2023.

Breza LC, Mooshammer M, Bowles TM, Jin VL, Schmer M, Grandy AS. Complex crop rotations improve organic N cycling. Virtual meeting, ASA-CSSA-SSSA International Annual Meeting, USA. 2020.

Project Experience

Fate and Transport of Soil Amendments

Applied stable isotope techniques and laboratory assays to quantify microbially mediated transformations of organic nitrogen (N) following soil amendments. Conducted complementary studies that integrated ¹⁵N amino acid pool dilution experiments to estimate gross mineralization and immobilization rates, ¹⁵N labeled residue decomposition experiment to trace organic N turnover, and a systematic review that used meta-analytical techniques to identify overarching patterns and controls on gross N transformations in the soil.

Carbon Stocks in Agricultural Soils

Led a regional soil survey across Oregon's Willamette Valley to evaluate changes in soil carbon stocks and soil health metrics under varying subsurface drainage age classifications. Conducted laboratory analyses of total and fractionated carbon pools and applied generalized additive mixed models (GAMMs) to estimate total carbon stocks and carbon distribution throughout the soil profile using an equivalent soil mass (ESM) framework.

Biological Nitrification Inhibition

Designed and implemented combined field and laboratory experiments to assess whether plant-derived secondary metabolites suppress ammonia monooxygenase activity and decrease nitrification rates. Evaluated both mechanistic processes and practical field-scale implications for nitrogen management.

Peer Reviews

Applied Soil Ecology

New Phytologist

Plant and Soil

Leverhulme Trust (proposal referee)