ZACHARY BENJAMIN FREEDMAN

Associate Professor
O.N. Allen Professor of Soil Microbiology
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EDUCATION

2012 **Ph.D.**, Ecology and Evolution, Rutgers University, New Brunswick, NJ

2005 **B.S.**, Biology, Fairfield University, Fairfield, CT

APPOINTMENTS

2027 – 2028	Visiting Scholar, Faculty of Agriculture & Environment, University of Sydney
2025 –	Associate Professor, Department of Soil and Environmental Sciences, University of Wisconsin–Madison
2021 –	O.N. Allen Professor of Soil Microbiology, University of Wisconsin–Madison
2020 –	Faculty Affiliate, Agroecology Program, University of Wisconsin–Madison
2020 –	Faculty Affiliate, Center for Ecology and the Environment, University of Wisconsin–Madison
2020 –	Faculty Affiliate, Microbiology Doctoral Training Program, University of Wisconsin–Madison
2020 –	Faculty Affiliate, Nelson Institute for Environmental Studies, University of Wisconsin–Madison
2020 – 2025	Assistant Professor, Department of Soil and Environmental Sciences, University of Wisconsin–Madison
2018 – 2020	Environmental Microbiology Program Coordinator, Division of Plant and Soil Sciences, West Virginia University
2016 – 2020	Assistant Professor, Division of Plant and Soil Sciences, West Virginia University
2012 – 2016	Postdoctoral Fellow, School for Environment and Sustainability, University of Michigan
2008 – 2011	GK12 Teaching Fellow, National Science Foundation and The Math and Science Learning Center, Rutgers University

PUBLICATIONS

55. Propson, B.E., W.A. Argiroff, G.A. Cagle, R.A. Upchurch, D.R. Zak, A.S. Grandy, and **Z.B. Freedman**. 2026. Anthropogenic nitrogen deposition decouples relationships with decomposing microbes, altering SOM molecular composition, but not molecular complexity or diversity. *npj Soil Ecology*. 1:3.

54. Cagle, G.A., B. Baiser, J.R. Bernardin, L.S. Bittleston, E.B. Young, S.M. Gray, and **Z.B. Freedman**. 2026. Carbon regime structures functional trait trajectories during microbial primary succession. *The ISME Journal*. 20(1), wrag134.

53. Baiser, B., Bernardin, J., Young, E.B., Cagle, G.A., **Freedman, Z.B.**, Gray, S.M., Divinagracia, E., Fluck, I.E., Gravel, D., LeClare, S., Long, Z.T., Record, R., Rhyner, K.M., and L.S. Bittleston. 2026. Uncovering the role of biogeography, resources, food web composition and time during microbial primary succession. *Proceedings of the Royal Society B: Biological Sciences*. 293 (2080): 20260396.

52. Chiang, A. W-L., **Z.B. Freedman**, A. Hartemink, and J. Huang. 2026. Inverse modeling and in situ soil moisture reveal land-use impacts on soil hydraulic properties. *Vadose Zone Journal*. 25, e70120.

51. Walters, A., G.A. Cagle, **Z.B. Freedman**, S. Conley, and M.R. Ruark. 2026. Soybean response to cover crop and nitrogen fertilizer timing on sandy soil. *Agronomy Journal*. 118(3), e70396.

50. Kane, J.L., R.G. Schartiger, **Z.B. Freedman**, and E.M. Morrissey. 2026. Organic nutrient amendments enhance the accrual of mineral associated soil organic carbon via microbial processes in a marginal Miscanthus agroecosystem. *Soil Biology and Biochemistry*. 214, 110063.

49. Judd, T.C., M.D. Ruark, Y. Rui, G.R. Sanford, and **Z.B. Freedman**. 2025. Mechanisms of soil organic matter persistence vary across time and soil depth in long-term cropping systems of the North Central US. *Agriculture, Ecosystems & Environment*. 393, 109769.

48. McGrew, A., **Z.B. Freedman**, and B. Baiser. 2025. Top-down processes drive taxonomic and phylogenetic diversity in a model aquatic microbial community. *Ecology*. 106, e70093.

47. Ghimire, S., Y. Zhang, J. Huang, E. L. W. Majumder, A. E. Hartemink, E. B. Graham, O. Qafoku, J. Andrews, and **Z.B. Freedman**. 2025. Using mid-infrared spectroscopy to estimate soil microbial properties at the continental scale. *Applied Soil Ecology*. 211, 106110.

46. Bernadin, J.R., E.B. Young, G.A. Cagle, **Z.B. Freedman**, L.S. Bittleston. 2025. Environmental stress shapes bacterial community structure and function through interactive abiotic effects. *Molecular Ecology*. 34, e70102.

45. Iwamoto, C. C. Siegert, J.J. Granger, K.P. Poudel, A. Polinko, and **Z.B. Freedman**. 2025. Limited impacts of activated carbon and mycorrhizal amendments for *Pinus echinata* reforestation on strip-mined soils. *Forests*. 16, 1316.

44. Cagle, G., B. Baiser, D. Gravel, T. Poissot, N. Gotelli, S. Record, L. Bittleston, E. Young, and **Z.B. Freedman**. 2024. Dispersal limitation governs bacterial community assembly in the northern pitcher plant (*Sarracenia purpurea*) at the continental scale. *Global Ecology and Biogeography*. 33(12), e13922.

43. Anderson, H., E. Majumder, E. Silva, J. Dawson, P. Simon, and **Z.B. Freedman**. 2024. Root exudate chemical composition differently selects for unique microbiome across crop cultivars. *Soil Biology and Biochemistry*. 197, 109516.

42. Propson, B.E., D.R. Zak, R.A. Upchurch, A. Classen, A. Burton, and **Z.B. Freedman**. 2024. Gains in soil carbon storage under anthropogenic nitrogen deposition are rapidly lost following its cessation. *Ecology*. 105(11), e4444.

41. Siemering, G.S., F.J. Arriaga, G. A. Cagle, J.M. Van Beek, and **Z.B. Freedman**. 2024. Impacts of vegetable processing and cheese making effluent on soil microbial functional diversity, community structure, and denitrification potential of land treatment systems. *Water Environment Research.* 96(5), e11036.

40. Graham, E. A.P. Camargo, R. Wu, R. Neches , M. Nolan , D. Paez-Espino, J. Blanchard, N. Kyrpides, J. Jansson, J. McDermott, K. Hofmockel, X. Jun, J. Rodrigues, **Z.B. Freedman**, P. Baldrian, M Štursová, K. DeAngelis, S. Lee, F. Godoy-Vitorino, Y.K. Yeoh, H. Cadillo-Quiroz, S. Tringe, A. Chauhan, D. Cowan, M. Van Goethem, T. Woyke, N. Dove , K. Konstantinidis, T. Juenger, S. Hart , D. Myrold, B. Bohannan, M. Schmer, N. Palmer, K. Nüsslein, T. Makhalanyane, K. Dynarski, N. Taş, G. Nicol, C. Hazard, E. Scully, K. Jain, D. Madamwar, A. Bissett, P. Constant, R. Oliveira, C. Takacs-Vesbach, M. Cregger, A Carrell, D. Klingeman, N. Pietrasiak. 2024. A global atlas of soil viruses reveals unexplored biodiversity and potential biogeochemical impacts. *Nature Microbiology*. 9, 1873–1883.

39. Grover, S., H. Anderson, C.N. Kelly, J. Schuler, M.D. Ruark, and **Z.B. Freedman**. 2024. Early production of switchgrass (*Panicum virgatum* L.) and willow (*Salix* spp.) indicates carbon

accumulation potential in Appalachian reclaimed mine and agriculture soil. *Soil Science Society of America Journal*. 88(3), 602-619.

38. Piñeiro Nevado, J., C. Dang, J. Walkup, T. Kuzniar, R. Winslett, S. Blazewicz, **Z.B. Freedman**, E. Brzostek, and E.M. Morrissey. 2024. Shifts in bacterial traits under chronic nitrogen deposition align with soil processes in arbuscular, but not ectomycorrhizal‐associated trees. *Global Change Biology*, 30(1), e17030.
37. Kane, J. L., K.B. Liseski, C. Dang, **Z.B. Freedman**, & E.M. Morrissey. 2024. Trade or scavenge? Miscanthus-microbiome interactions depend upon soil fertility. *Applied Soil Ecology*, 196, 105289.
36. Kane, J. L., R.G. Schartiger, N.K. Daniels, **Z.B. Freedman,** L.M. McDonald, J.G. Skousen, and E.M. Morrissey. 2023. Bioenergy crop *Miscanthus* x *giganteus* acts as an ecosystem engineer to increase bacterial diversity and soil organic matter on marginal land. *Soil Biology and Biochemistry*, 186, 109178.
35. Ye, Y., H. Wang, J. Luan, J. Ma, A. Ming, B. Niu, C. Liu, **Z.B. Freedman**, J. Wang, and S. Liu. 2023. Nitrogen-fixing tree species modulate species richness effects on soil aggregate-associated organic carbon fractions. *Forest Ecology and Management*, 546, p.121315.
34. Wang, H., Y. Ding, Y. Zhang, J. Wang, **Z. B. Freedman**, P. Liu, W. Cong, J. Wang, R. Zang, S. Liu. 2023. Evenness of soil organic carbon chemical components changes with tree species richness, composition and functional diversity across forests in China. *Global Change Biology*, 29(10), 2852-2864.
33. Kane, J. L., J. Kotcon, **Z. B. Freedman**, and E. M. Morrissey. 2023. Fungivorous nematodes drive microbial diversity and carbon cycling in soil. *Ecology*. e3844.
32. Kane, J.L., M.C. Robinson, R.G. Schartiger, **Z.B. Freedman**, L.M. McDonald, J.G. Skousen and E.M. Morrissey. 2022. Nutrient management and bioaugmentation interactively shape plant-microbe interactions in *Miscanthus* x *giganteus*. *Global Change Biology Bioenergy.* 14:1235–1249.
31. Kelly, C. N., J. Koos, T. Griggs, and Z. B. Freedman. 2022. Prescribed defoliation strategies influence soil carbon and nitrous oxide potential in pastures. *Agronomy Journal*. 114: 2264– 2279. *research highlighted in CSA News (doi: 10.1002/csan.20850)
30. Martin, G., E. M. Morrissey, W. Carson, and **Z. B. Freedman**. 2022. A legacy of fire emerges from multiple disturbances to most shape microbial and nitrogen dynamics in a deciduous forest. *Soil Biology and Biochemistry*. 108672.
29. Zhang, Y., **Z. B. Freedman**, A. E. Hartemink, T. Whitman, and J. Huang. 2022. Characterizing soil microbial properties using MIR spectra across 12 ecoclimatic zones (NEON sites). *Geoderma*. 409: 115647.
28. Bittleston, L. S., **Z. B. Freedman**, J. R. Bernadin, J. J. Grothjan, E. B. Young, S. Record, B. Baiser, and S. M. Gray. 2021. Exploring microbiome functional dynamics through space and time with trait-based theory. *mSystems*. 6(4): e00530-21.
27. DeForest, J., R. Dorkoski, **Z. B. Freedman**, and K. Smemo. 2021. Multi-year soil microbial and extracellular phosphorus enzyme response to lime and phosphate addition in temperate hardwood forests. *Plant and Soil*. 464: 391–404.
26. **Freedman, Z. B.**, A. McGrew, B. Baiser, M. Besson, D. Gravel, T. Poisot, S. Record, L. Trotta, and N. Gotelli. 2021. Environment-host-microbial interactions shape the *Sarracenia purpurea* microbiome at the continental scale. *Ecology*. 102(5): e03308.
25. Carrara, J., C. Walter, **Z. B. Freedman**, J. S. Hawkins, and E. R. Brzostek. 2021. Differences in microbial community response to nitrogen fertilization result in unique enzyme shifts between arbuscular and ectomycorrhizal dominated soils. *Global Change Biology*. 27(10): 2049-2060.

24. Dang, C., E. Kellner, G. Martin, **Z. B. Freedman**, J. Hubbart, K. Stephan, C. Kelly, and E. M. Morrissey. 2021. Land use intensification destabilizes stream microbial biodiversity and decreases metabolic efficiency. *Science of The Total Environment.* 767: 145440.
23. Martin, G., C. Dang, E. M. Morrissey, E. Kellner, J. Hubbart, K. Stephan, E. Kutta, C. Kelly, and **Z. B. Freedman**. 2021. Stream sediment bacterial communities exhibit temporally-consistent and distinct thresholds to land use change in a mixed-use watershed. *FEMS Microbiology Ecology.* 97 (2): fiaa256.
22. Kane, J., E. M. Morrissey, J. Skousen, and **Z. B. Freedman**. 2020. Soil microbial succession following surface mining is governed primarily by deterministic factors. *FEMS Microbiology Ecology*. 96(11): fiaa114.
21. Zhang, X., S. Liu, J. Wang, Y. Huang, **Z. B. Freedman**, S. Fu, K. Liu, H. Wang, X. Li, M. Yao, X. Liu, and J. Schuler. 2020. Local community assembly mechanisms shape soil bacterial β-diversity patterns along latitudinal gradients in eastern China. *Nature Communications*. 11: 5428.
20. Walkup, J., **Z. B. Freedman**, J. Kotcon, and E. M. Morrissey. 2020. Pasture in crop rotations influences microbial biodiversity and function reducing the potential for nitrogen loss from compost. *Agriculture, Ecosystems & Environment.* 304: 107122.
19. Zak, D. R., W. A. Argiroff, **Z. B. Freedman**, R. A. Upchurch, and K. J. Romanowicz. 2019. Anthropogenic N Deposition, Fungal Gene Expression, and an Increasing Soil Carbon Sink in the Northern Hemisphere. *Ecology*. 100(10): e02804.
18. Landesman, B., **Z. B. Freedman**, and D. Nelson. 2019. Seasonal, sub-seasonal and diurnal variation of soil bacterial community composition in a temperate deciduous forest. *FEMS Microbiology Ecology*. 95(2): fiz002.
17. Kellner, E., J. Hubbart, K. Stephan, E. M. Morrissey, **Z. B. Freedman**, E. Kutta, and C. Kelly. 2018. Characterization of sub-watershed-scale stream chemistry regimes in an Appalachian mixed-land-use watershed. *Environmental Monitoring and Assessment*. 190(10): 586.
16. Entwistle, E. M., K. J. Romanowicz, W. A. Argiroff, **Z. B. Freedman**, J. J. Morris, and D. R. Zak. 2018. Anthropogenic N deposition alters the composition of expressed class II fungal peroxidases. *Applied and Environmental Microbiology*. 84(9): e02816-17.
15. Cline, L. C., D. R. Zak, R. A. Upchurch, **Z. B. Freedman**, and A. R. Peschel. 2017. Soil microbial communities and elk migratory behavior: implications for soil biogeochemical cycling in the sagebrush steppe. *Ecology Letters*. 20(2): 202-211.
14. Zak, D. R., **Z. B. Freedman**, R. A. Upchurch, M. Steffens, and I. Kögel-Knabner. 2017. Anthropogenic N deposition increases soil organic matter accumulation without altering its biochemical composition. *Global Change Biology.* 23(2): 933-944.
13. **Freedman, Z. B.**, R. A. Upchurch, and D. R. Zak. 2016. Microbial potential for ecosystem N loss is increased by experimental N deposition. *PLoS ONE.* 11(10), e0164531.
12. Romanowicz, K. J., **Z. B. Freedman**, R. A. Upchurch, W. A. Argiroff, and D. R. Zak. 2016. Active microorganisms in forest soils differ from the total community yet are shaped by the same environmental factors: the influence of pH and soil moisture. *FEMS Microbiology Ecology*. 92: w149. **Selected as Editor's Choice.*
11. **Freedman, Z. B.,** R. A. Upchurch, D. R. Zak, and L. C. Cline. 2016. Anthropogenic N deposition slows decay by favoring bacterial metabolism: Insights from metagenomic analyses. *Frontiers in Microbiology*. 7: 259.
10. **Freedman, Z. B.**, and D. R. Zak. 2015. Atmospheric N deposition alters connectance, but not functional potential among saprotrophic bacterial communities. *Molecular Ecology.* 24: 3170-3180.

9. **Freedman, Z. B.**, R. A. Upchurch, K. J. Romanowicz, and D. R. Zak. 2015. Differential responses of total and active soil microbial communities to future rates of atmospheric N deposition. *Soil Biology and Biochemistry*. 90: 275-282.
8. **Freedman, Z. B.**, and D. R. Zak. 2015. Soil bacterial communities are shaped by dispersal limitation and environmental filtering: evidence from a long-term chronosequence. *Environmental Microbiology.* 17: 3208-3218.
7. Peschel, A., D. R. Zak, L. C. Cline, and **Z. B. Freedman**. 2015. Elk, sagebrush, and saprotrophs: indirect top-down control on microbial community composition and function. *Ecology.* 96: 2383–2393.
6. **Freedman, Z. B.**, and D. R. Zak. 2014. Atmospheric N deposition increases bacterial laccase-like multicopper oxidases: implications for organic matter decay. *Applied and Environmental Microbiology*. 80: 4460-4468. **Selected for Editor's Spotlight.*
5. Eisenlord, S. D., **Z. B. Freedman**, D. R. Zak. K. Xue, X. He, and J. Zhou. 2013. Microbial mechanisms mediating increased soil C storage under elevated atmospheric N deposition. *Applied and Environmental Microbiology.* 79: 1191-1182.
4. **Freedman, Z. B.**, S. D. Eisenlord, D. R. Zak, K. Xue, X. He, and J. Zhou. 2013. Towards a molecular understanding of N cycling in northern hardwood forests under future rates of N deposition. *Soil Biology and Biochemistry.* 66: 130-138.
3. **Freedman, Z. B.**, C. Zhu, and T. Barkay. 2012. Mercury resistance and mercuric reductase activities and expression among chemotrophic thermophilic Aquificae. *Applied and Environmental Microbiology.* 78: 6568-6575.
2. Wang, Y., **Z. B. Freedman**, P. Lu-Irving, R. Kaletsky, and T. Barkay. 2009. An initial characterization of the mercury resistance (*mer*) system of the thermophilic bacterium *Thermus thermophilus* HB27. *FEMS Microbiology Ecology.* 67: 118-129.
1. Lefcort, H., **Z. B. Freedman**, S. House, and M. Pendleton. 2008. Hormetic effects of heavy metals in aquatic snails: is a little bit of pollution good? *EcoHealth*. 5**:** 10-17.

RESEARCH FUNDING

2027 – 2031	U.S. Department of Agriculture, National Institute of Food and Agriculture. *Rewilding microbiomes and rootstocks towards nitrogen-smart hemp production practices* (PI; $850,000*;* $564,059 to ZBF)
2026 – 2031	U.S. Department of Agriculture, Agricultural Research Service. *Biological Pathways to Sustainable Nitrogen Use in Carrot Agroecosystems* (PI; $633,150 to ZBF)
2025 – 2028	U.S. Department of Energy, Joint Genome Institute. *How do viral-microbial interactions shape soil C biogeochemistry in northern temperate forests*? (PI; $75,000 *in kind* for analytical costs to ZBF)
2023 – 2027	U.S. Department of Agriculture, National Institute of Food and Agriculture. *Unraveling the microbial mechanisms that mediate disease resurgence in plants following fungicide application*. (Co-PI; $849,916; $388,438 to ZBF)
2023 – 2026	U.S. Department of Agriculture, Hatch Formula Funds. *Improving our mechanistic understanding of winter climate change on soil aggregation through examining the role of microbes across three disparate soil ecosystems in Wisconsin*. (Co-PI; $142,000)
2022 – 2026	U.S. National Science Foundation. *SitS: Leveraging spectroscopy and in situ soil sensing for prediction of keystone soil microbiome functions*. (PI; $1,200,000; $725,216 to ZBF)

2022 – 2024 U.S. Department of Agriculture, Equipment Grant Program. *Enhancing the capacity for carbon and nitrogen isotopic analysis of soil, plant, and animal materials.* (PI; $244, 115)

2022 – 2024 University of Wisconsin-Madison, Office of the Vice Chancellor of Graduate Research and Education, Research Core Improvement Grant. *Replacement and upgrade of two aging instruments for carbon and nitrogen quantification and isotopic analysis of soil, plant and animal materials.* (PI; $124,072)

2022 – 2024 U.S. Department of Agriculture, Hatch Formula Funds. *Assessing the microbial response to forest ecosystem recovery from historically high rates of atmospheric nitrogen deposition*. (PI; $112,000)

2021 – 2026 U.S. Department of Agriculture, National Institute of Food and Agriculture. *CIOA3 – Carrot Improvement for Organic Agriculture: Leveraging On-Farm and Below Ground Networks*. (PI of UW-Madison Subaward $812,615; $545,145 to ZBF)

2021 – 2025 U.S. National Science Foundation, Understanding the Rules of Life: Microbiome Theory and Mechanisms. *Collaborative Research: MTM2: Using successional dynamics, biogeography, and experimental communities to examine mechanisms of plant-microbiome functional interactions*. (PI; $1,245,329; $286,858 to ZBF)

2020 – 2026 U.S. Department of Agriculture, National Institute of Food and Agriculture, Sustainable Agricultural Systems. *Mid-Atlantic Sustainable Biomass for Value-added Products Consortium (MASBio)*. (Co-PD; $9,999,982; $311,903 to ZBF)

2019 – 2023 U.S. Department of Agriculture, National Institute of Food and Agriculture. *Leveraging plant-microbe interactions to increase nutrient use efficiency and bioenergy crop yield on marginal lands*. (Co-PD; $749,743; $171,624 to ZBF [ZBF served as PD for 2019-2020 and transferred to Co-PD role with move to UW-Madison])

2018 – 2022 U.S. Department of Agriculture, Forest Service. *Monitoring soil pathogen communities and nutrients in black cherry stands on the Allegheny National Forest*. (PI; $280,000)

2018 – 2021 U.S. Department of Energy, Established Program to Stimulate Competitive Research (EPSCoR), Office of Basic Energy Sciences. *Quantitative, trait-based microbial ecology to accurately model the impacts of nitrogen deposition on soil carbon cycling in the Anthropocene*. (Co-PI; $729,681)

2017 – 2018 West Virginia University, Research and Scholarship Advancement Award. *Restoration of the soil microbiome following mined lane reclamation*. (PI; $15,000)

2017 – 2018 U.S. Department of Energy, Joint Genome Institute Community Science Program. *Assessing the recovery of microbial traits in bioenergy crop agroecosystems on reclaimed surface mines*. (PI; provided 360 Gb metagenomic sequencing)

2016 – 2019 U.S. Department of Agriculture, Natural Resources Conservation Service. *Prescribed grazing impacts on grassland rooting and soil microbial dynamics: Implications for soil organic matter development and nitrous oxide emissions*. (Co-PI; $250,142)

2013 – 2017 U.S. Department of Energy, Office of Biological and Environmental Research. *Atmospheric nitrogen deposition and microbial mechanisms enhancing soil carbon storage* (Senior Personnel; $1,467,520)

2012 – 2014 U.S. Department of Agriculture, McIntyre-Stennis Funds. *Does atmospheric nitrogen deposition reduce the diversity and ligninolytic potential of bacteria in Michigan hardwood forests?* (Co-PI; $60,000)

2007 National Science Foundation, Yellowstone National Park Research Coordination Network. *Isolation and characterization of early evolving mercury resistant bacteria in Yellowstone National Park.* ($1,700)

AWARDS AND HONORS

2026	O. N. Allen Professorship in Soil Microbiology, Department of Soil and Environmental Sciences, University of Wisconsin-Madison
2021	O. N. Allen Professorship in Soil Microbiology, Department of Soil and Environmental Sciences, University of Wisconsin-Madison
2020	Junior Faculty Award, Gamma Sigma Delta, the Honor Society of Agriculture (West Virginia Chapter)
2019	Excellence in Teaching, Division of Plant and Soil Sciences, West Virginia University
2011	Excellence in Graduate Studies Award, Theobald Smith Society, the NJ Branch of the American Society for Microbiology
2010	Outstanding Oral Presentation, Theobald Smith Society, the NJ Branch of The American Society for Microbiology Annual Meeting
2010	Academic Excellence Award, Department of Ecology and Evolution, Rutgers University
2008	Robert A. and Eileen S. Robison Award for Excellence in Graduate Studies, Department of Biochemistry and Microbiology, Rutgers University
2007	Karl C. Ivarson Award, Rutgers University

TEACHING EXPERIENCE AND OTHER PROFESSIONAL DEVELOPMENT

University of Wisconsin-Madison

2026	Participant, Designing for Pedagogical Change Program
2026 –	Instructor, Soil Microbiology and Biochemistry (SOILSCI 523)
2026	Guest Lecturer, Forum on the Environment (ENVIRST/SOILSCI 101)
2025	Instructor, Introduction to Environmental Science (SOILSCI 250)
2025	Guest Lecturer, Introduction to Plant Science and Technology (PST 110)
2025	Guest Lecturer, Introduction to Ecology Research (ZOO 953)
2025	Guest Lecturer, Forum on the Environment (ENVIRST/SOILSCI 101)
2025	Panelist, Tenure Success Stories, Physical Sciences Division
2023 – 2024	Guest Lecturer, Introduction to Horticulture (HORT 120)
2022	Participant, Advancing Faculty Mentoring Practice, Wisconsin Institute for Science Education and Community Engagement
2022	Panelist, Active Learning in Large Enrollment Courses Workshop, Delta Program
2021 – 2022	Fellow, Madison Teaching and Learning Excellence (MTLE) program
2021 – 2024	Instructor, Soil Biology Module, Soil Health and Sustainability for Field Staff Training, Natural Resources Conservation Service (WI)
2020 – 2023	Instructor, Forum on the Environment (ENVIRST/SOILSCI 101)
2020 –	Instructor, Soil Biology (SOILSCI 323)

West Virginia University

2019 – 2020	Instructor, Microbial Biochemistry and Analysis (EM 593)
2019 – 2020	Participant, First2 Network, an NSF INCLUDES program
2019	Guest Lecturer, Bio-Based Energy Systems (WDCS 444)
2018 – 2020	Instructor, Living in a Microbial World (EM 216)

2018 – 2020 Instructor, Environmental Microbiology (EM 401)

2017 – 2020 Instructor, General Microbiology (EM 341)

Other Teaching Experience and Development

2016 Guest Lecturer, Agroecosystem Management (EAS 524), University of Michigan

2013 Preparing Future Faculty Workshop, Rackham School of Graduate Studies and The Center for Research on Learning and Teaching, University of Michigan

2008 – 2011 GK12 Teaching Fellowship, National Science Foundation and The Math and Science Learning Center, Rutgers University

2005 – 2008 Teaching Assistant, General Microbiology, Rutgers University

2004 – 2005 Teaching Assistant, General Biology and General Ecology, Fairfield University

MENTORSHIP

University of Wisconsin-Madison

Postdoctoral Fellows

2022 – 2025 Grace Cagle

2020 – 2021 Emmanuel Vásquez-Rivera

Graduate Committee Chair

2026 – Andrew Molodchenko (MS expected 2028)

2025 – Hannia Ramirez Gutierrez (MS expected 2027)

2023 – Soni Ghimire (PhD expected 2026)

2023 – 2026 Erica Shoenberger (PhD)

2023 – 2025 Clare Tallamy (MS)

2022 – Gwendolyn Pipes (PhD expected 2026)

2022 – 2025 Tanner Judd (PhD)

2022 – 2023 Hannah Anderson (MS)

2021 – 2026 Brooke Propson (PhD)

2021 – 2023 Salvador Grover (MS)

Graduate Committee Member

2026 – Sarah Caroline de Souza (Plant Pathology; PhD expected Spring 2030)

2025 – Shabda Gajbhiye (Atmospheric and Oceanic Sciences; PhD expected Spring 2029)

2025 – Stacy Nuryadi (Geography; PhD expected Spring 2028)

2025 – Peter Bier (Soil Science; PhD expected Spring 2028)

2025 – Josh Mirabella (Soil Science; PhD expected Spring 2028)

2025 – Aquila Wei-Lan Chiang (Soil Science; MS expected Spring 2027)

2025 – Jessica Rohde (Plant Breeding and Plant Genetics; PhD expected Spring 2029)

2025 – Jessica King (Agroecology; MS expected Spring 2027)

2025 – Elizabeth Lane (Plant Pathology; PhD expected Spring 2028)

2024 – Yanyu Deng (Soil Science; PhD expected Spring 2027)

2024 – Daniel Igirimbabazi (Soil Science; PhD expected Spring 2028)

2023 – James Kosmopoulos (Microbiology Doctoral Training Program, PhD expected Spring 2026)
2023 – Grace Connelly (Environment and Resources; PhD expected Spring 2027)
2023 – 2026 Noah Anderson (MS, Soil Science)
2023 – 2025 Aldo Arellano (PhD, Microbiology Doctoral Training Program)
2022 – 2026 Shyanne Lee (Soil Science; PhD expected 2026)
2022 – 2025 Soledad Orcasberro (PhD, Agronomy)
2022 – 2025 Angela Leon Tinoco (PhD, Agronomy)
2022 – 2025 Esther Stewart (PhD, Geosciences)
2022 – 2023 Hieu Minh Truong (Microbiology Doctoral Training Program; did not complete)
2022 – 2023 Grace Connelly (MS, Agroecology)
2021 – 2023 Walker Crane (MS, Soil Science)
2021 – 2025 Damayanti Rodriguez Ramos (PhD, Microbiology Doctoral Training Program)

Graduate Committee Member at Other Universities as External Committee Member

2022 - 2024 Casey Imawoto (PhD, Mississippi State University)

Undergraduate Independent Study and Honors Theses

2026 Kate Clausen (BS expected 2027)
2024 Linnea Pelto (BS expected 2025)
2022 Alessia Funtanchese (BS expected 2023)
2021 Owen Matts (BS expected 2024)
2021 Anella Cousin (BS expected 2023)
2020 Annalisa Stevenson (BS, 2021)

Research Specialists

2026 – Emily Kaufman
2022 – 2026 Annalise Keaton
2021 – 2022 Zoë Goodrow

Visiting Scholars

2027 Emily Brooks (PhD Student, Department of Earth and Environmental Sciences, University of Manchester, U.K.)
2026 Erdal Yardim (Professor, Department of Plant Protection, University of Siirt, Türkiye)

West Virginia University

Graduate Committee Chair

2018 – 2022 Jen Kane (PhD, 2022. Co-advised with Dr. Ember Morrissey)
2019 – 2022 Gregory Martin (PhD, 2022. Co-advised with Dr. Ember Morrissey)
2019 – 2021 Kieran Liseski (MS, 2021. Co-advised with Dr. Ember Morrissey)
2017 – 2019 Jen Kane (MS, 2019)
2017 – 2019 Brianna Mayfield (MS, 2019)
2016 – 2018 Jordan Koos (MS, 2018)

Graduate Committee Member

2022 – 2024 Mica Keck (MS, 2024)
2017 – 2021 Kawang Li (PhD, 2021)
2017 – 2021 Nannette Raczka (PhD, 2021)
2019 – 2021 Emma Fox-Fogle (MS, 2021)
2018 – 2024 Chansotheary Dang (PhD, 2024)
2018 – 2021 Braley Burke (MS, 2021)
2018 – 2020 Fritz Peterson (PhD, 2020)
2017 – 2020 Joseph Cararra (PhD, 2020)
2017 – 2020 Angela Lamp (PhD, 2020)
2017 – 2018 Fritz Peterson (MS, 2018)
2017 – 2019 Andrew Shall (MS, 2019)
2016 – 2018 Jeth Walkup (MS, 2018)

Undergraduate Independent Study and Honors Theses

2019 – 2020 Abby Paul (BS, 2021)
2019 – 2020 Sean Estep (BS, 2020)
2019 – 2020 Shayna Redford (BS, 2021)
2017 – 2019 Kinsey Reed (BS, 2019)

Undergraduate Research Assistants

2019 – 2020 Tanner Judd (BS, 2020)
2019 – 2020 Sarah Dalen (BS, 2021)
2019 – 2020 Brice Rjasko (BS, 2021)
2019 Manar Chowdhury (BS, 2020)
2019 Adrian Romero (Visiting Student, BS, 2021, University of Kansas)
2018 – 2020 Reagan Ross (BS, 2020)
2018 – 2019 Joshua Mirabella (BS, 2020)
2018 Joshua Bombard (BS, 2020)
2016 – 2019 Elisabeth Six (BS, 2019)
2017 – 2019 Nick Dolan (BS, 2019)
2017 – 2019 Taylor Paeth (BS, 2019)
2017 – 2018 Emel Kangi (BS, 2018)
2017 – 2018 Jonathan Williamson (BS, 2018)
2017 – 2018 Molly Roberts (BS, 2018)

INVITED PRESENTATIONS

40. Propson, B.E. and **Freedman, Z.B.** 2027. Unearthing Legacy Effects of Anthropogenic Nitrogen Deposition on Microbial Mechanisms Mediating Soil Carbon Storage. Ecological Society of America Annual Meeting, Toronto, ON, July.
39. **Freedman, Z.B.** 2026. Microbial mediation of forest soil carbon fluxes in the Anthropocene. University of California, Riverside, Department of Plant Pathology Seminar Series, Riverside, CA, October.
38. **Freedman, Z.B.** 2026. Microbial mediation of forest soil carbon fluxes in the Anthropocene. University of Wisconsin-Madison, Department of Bacteriology Kenneth Raper Symposium, Madison, WI, August.
37. **Freedman, Z.B.** 2025. Using soil spectroscopy and ecological networks for unravelling biogeochemically-important soil microbial properties. American Geophysical Union Annual Meeting, New Orleans, LA, December.
36. **Freedman, Z.B.** 2025. Microbial mediation of forest soil carbon fluxes in the Anthropocene. Iowa State University Department of Ecology, Evolution and Behavior, Ames, IA, April.
35. **Freedman, Z.B.** 2024. Don't miss the microbes for the trees: A microbial mechanism fostering ecosystem carbon storage and loss with climate change. Washington State University Department of Biology, Virtual, April.
34. **Freedman, Z.B.** 2024. It's the little things that count: unraveling the link between microbial ecology and the future fate of soil carbon. Donald J. Ross Memorial Seminar Series, Fairfield University Department of Biology, Fairfield, CT, March.
33. **Freedman, Z.B.** 2023. *Miscanthus* x *giganteus* acts as an ecosystem engineer to increase soil C in Appalachian bioenergy agroecosystems. Soil Health Nexus Digital Café, Virtual, October.
32. **Freedman, Z.B.** and C. Gross 2023. Moving toward a carbon sequestration approach that recognizes and enhances soil biodiversity. Ecological Society of America Annual Meeting, Portland, OR, August.
31. **Freedman, Z.B.** 2023. Leveraging citizen science to investigate big questions about tiny organisms: Introducing the Schoolyard Microbiome Project. ASM-Microbe Annual Meeting, Houston, TX, June.
30. **Freedman, Z.B.** 2022. It's the little things that count: Illuminating the microbial "black box" of soil ecology. Univ. of Wisconsin-Milwaukee, Biological Sciences Colloquium, Milwaukee, WI, November**.**
29. Kelly, C., **Z.B. Freedman**, and S. Grover. 2022. Sustainability of bioenergy crop production with biochar on reclaimed mine and marginal agricultural lands. North American Biochar & Bioenergy Annual Conf., Morgantown, WV, August.
28. **Freedman, Z.B.** 2021. Leveraging long-read metagenomics to illuminate Hg-methylating microbial guilds. SPRUCE Hg Working Group Seminar, Univ. of Minnesota, St. Paul, MN, October.
27. **Freedman, Z.B.** 2021. Bringing marginal lands to the center of biofuel crop production by harnessing the power of the microbiome. Department of Plant Pathology Seminar, Univ. of Wisconsin-Madison, Madison, WI, September.
26. **Freedman, Z.B.** 2021. Bringing marginal lands to the center of biofuel crop production by harnessing the power of the microbiome. Soil Science 728 Graduate Seminar, Univ. of Wisconsin-Madison, Madison, WI, September.
25. **Freedman, Z.B.** 2021. Utilizing carnivorous plants and good friends to explore the macroecology of microbial community dynamics. Biology Department Colloquium, Univ. of Northern Iowa, Cedar Falls, IA, March.

24. **Freedman, Z.B.** 2020. Environment-host-microbial interactions shape the Sarracenia purpurea microbiome across scales. Microbiome Hub Seminar Series, Univ. of Wisconsin-Madison, Madison, WI, March.
23. **Freedman, Z.B.** 2020. Don't Miss the Microbes for the Trees: A Microbial Mechanism Fostering Future Ecosystem Carbon Storage. Department of Biochemistry and Microbiology, Rutgers Univ., New Brunswick, NJ, March.
22. **Freedman, Z.B.** 2019. Anthropogenic N deposition increases soil C storage by differentially impacting soil bacteria and fungi across a northern hardwood forest ecosystem**.** Soil Science Society of America Annual Meetings, San Antonio, TX.
21. **Freedman, Z.B.** 2019. Environment-host-microbial interactions shape the Sarracenia purpurea microbiome at the continental scale. ASM Microbe Annual Meeting, San Francisco, CA.
20. **Freedman, Z.B.** 2019. Don't miss the microbes for the trees: a microbial mechanism fostering future ecosystem carbon storage. Dept. of Microbiology and Immunology, West Virginia Univ., Morgantown, WV.
19. **Freedman, Z.B.** 2018. Don't miss the microbes for the trees: a microbial mechanism fostering future ecosystem carbon storage. Dept. of Biology, Duquesne Univ., Pittsburgh, PA.
18. ***Freedman, Z.B.** 2018. Anthropogenic N deposition suppresses saprotrophic fungal activity in a northern hardwood forest ecosystem. Roach Bauer Forestry Forum, U.S. Dept. of Agriculture (USDA) Forest Service, Kane, PA. *keynote speaker.
17. **Freedman, Z.B.** 2017**.** Don't miss the microbes for the trees: Anthropogenic N deposition suppresses saprotrophic fungal activity across a northern hardwood forest ecosystem. Ecological Society of America Annual Meeting, Portland, OR.
16. **Freedman, Z.B.** 2017. Don't miss the microbes for the trees: a potential mechanism fostering future ecosystem carbon storage under future rates of nitrogen deposition. Department of Environmental and Plant Biology, Ohio Univ., Athens, OH.
15. **Freedman, Z.B.** 2017. Don't miss the microbes for the trees: a potential mechanism fostering future ecosystem carbon storage under future rates of nitrogen deposition. USDA Forest Service, Northeastern Research Station, Morgantown, WV.
14. **Freedman, Z.B.** 2016. Don't miss the microbes for the trees: a potential mechanism fostering future ecosystem carbon storage under future rates of nitrogen deposition. Univ. of Maryland Center for Ecosystem Science, Frostburg, MD.
13. **Freedman, Z.B.**, and D.R. Zak. 2015. Atmospheric N deposition alters co-occurrence, but not functional potential among saprotrophic bacterial communities. Ecological Society of America Annual Meeting, Baltimore, MD.
12. **Freedman, Z.B.** 2015. Don't miss the microbes for the trees: a potential mechanism fostering future ecosystem carbon storage under future rates of nitrogen deposition. Dept. of Biology, Illinois Institute of Technology, Chicago, IL.
11. **Freedman, Z.B.** 2015. Don't miss the microbes for the trees: a potential mechanism fostering future ecosystem carbon storage under future rates of nitrogen deposition. Division of Plant and Soil Science, West Virginia Univ., Morgantown, WV.
10. **Freedman, Z.B.** 2015. Don't miss the microbes for the trees: a potential mechanism fostering future ecosystem carbon storage under future rates of nitrogen deposition. Dept. of Ecosystem Science and Management, Univ. of Wyoming, Laramie, WY.
9. **Freedman, Z.B.** 2015. Don't miss the microbes for the trees: a potential mechanism fostering future ecosystem carbon storage under future rates of nitrogen deposition. Dept. of Biology, Eastern Michigan Univ., Ypsilanti, MI.

8. **Freedman, Z.B.** 2014. Don't miss the microbes for the trees: a potential mechanism fostering future ecosystem carbon storage under future rates of nitrogen deposition. The New College of Interdisciplinary Arts and Sciences, Arizona State Univ., Glendale, AZ.
7. **Freedman, Z.B.** 2011. Some Like it Hot: Effects of Environmental Factors on the Diversity and Distribution of *merA* in Yellowstone National Park Hot Springs. School of Natural Resources and Environment, Univ. of Michigan, Ann Arbor, MI. (Approximate number of attendees: 20)
6. **Freedman, Z.B.** 2011. Some Like it Hot: Effects of Environmental Factors on the Diversity and Distribution of *merA* in Yellowstone National Park Hot Springs. Dept. of Marine Science, Univ. of Georgia, Athens, GA.
5. **Freedman, Z.B.** 2011. Some Like it Hot: Effects of Environmental Factors on the Diversity and Distribution of *merA* in Yellowstone National Park Hot Springs Dept. of Biology, Fairfield Univ., Fairfield, CT.
4. **Freedman, Z.B.** 2011. Some Like it Hot: Effects of Environmental Factors on the Diversity and Distribution of *merA* in Yellowstone National Park Hot Springs. Dept. of Biochemistry and Microbiology, Rutgers Univ., New Brunswick, NJ.
3. **Freedman, Z.B.** 2011. *mer*-riment in Hot and Hostile Environments: Interactions of Aquificales with Mercury. Theobald Smith Society Annual Meeting, New Brunswick, NJ.
2. **Freedman, Z.B.** 2010. Isolation and characterization of mercury resistance in thermophilic, early branching *Aquificae***.** Theobald Smith Society Annual Meeting, New Brunswick, NJ.
1. **Freedman, Z.B.** 2008. Isolation and characterization of mercury resistance in thermophilic, early branching *Aquificae***.** National Science Foundation Yellowstone National Park Research Coordination Network Workshop, Mammoth, WY.

SELECT OTHER PRESENTATIONS

Key: *Presenting author; Freedman Lab student author

81. *Ghimire, S., J. Huang, E.L-W. Majumder, A.E. Hartemink, and **Z.B. Freedman**. 2026. Can We Use Spectroscopic Soil Sensing to Predict Microbial Functions Associated with Soil Carbon Dynamics across Natural Ecosystems at the Continental Scale? AGU Annual Meeting, San Francisco, CA, Dec 2026. (Contributed oral presentation).
80. *Ghimire, S., J. Huang, E.L-W. Majumder, A.E. Hartemink, and **Z.B. Freedman**. 2026. Can We Use Spectroscopic Soil Sensing to Predict Microbial Functions Associated with Soil Carbon Dynamics across Natural Ecosystems at the Continental Scale? CANVAS Annual Meeting (Soil Science Society of America), Portland, OR, Nov 2026. (Contributed oral presentation).
79. *Pipes, G., and **Z.B. Freedman**. 2026. Disentangling the Relationship between Microbial Taxonomic and Functional Succession In an 87-Year Post-Fire Forest Chronosequence. CANVAS Annual Meeting (Soil Science Society of America), Portland, OR, Nov 2026. (Contributed oral presentation).
78. *Ramírez Gutiérrez, H., A.S. Gaston, C. Tallamy, J. Dawson, E. Silva, A. Schuh, P. Simon, and **Z.B. Freedman**. 2026. Evaluation of Site Factors, Plant Genetics, and Microbiomes on the Post-Harvest Quality of Organically Produced Carrots In Wisconsin. CANVAS Annual Meeting (Soil Science Society of America), Portland, OR, Nov 2026. (Contributed oral presentation).
77. *Anderson, H.A., K. Linderman, A.E. Hartemink, C.N. Kelly, J. Schuler, **Z.B. Freedman**, and J. Huang. 2026. Soil Organic Carbon Under Perennial Biomass Production on Appalachian Reclaimed Mine Soils. CANVAS Annual Meeting (Soil Science Society of America), Portland, OR, Nov 2026. (Contributed poster presentation).
76. ***Z.B. Freedman**. 2026. My winding road to exploring microbial controls on soil C in a changing world. UW-Madison BioHouse Living and Learning Community, Madison, WI, September 2026.

75. *Propson, B., A. Stevenson, D.R. Zak, A.T. Classen, A. Burton, and **Z.B. Freedman**. 2026. Unearthing Legacy Effects of Anthropogenic Nitrogen Deposition on Microbial Mechanisms Mediating Soil Carbon Storage. BIOGEOMON, Upsala, Sweden, June 2026.
74. *Propson, B., A. Stevenson, D.R. Zak, A.T. Classen, A. Burton, and **Z.B. Freedman**. 2026. Unearthing Legacy Effects of Anthropogenic Nitrogen Deposition on Microbial Mechanisms Mediating Soil Carbon Storage. Soil Ecology Society Biennial Meeting, Southampton Township, NJ, May 2026.
73. *Chen, J., **Z.B. Freedman**, Y-C Wang and X. Pan. 2026. Fabrication of Whole-Biomass Adsorbent Beads via $CaBr_2$ Processing for Antibiotic Removal and Soil Environmental Safety. American Institute of Chemical Engineers Annual Meeting, Minneapolis, MN, Nov 2026. (Contributed oral presentation).
72. *Ghimire, S., Y. Zhang, J. Huang, A.E. Hartemink, E.L-W. Majumder, E. Graham, E. Qafoku, and **Z.B. Freedman**. 2025. Estimation of Soil Microbial Properties with Mid-infrared Spectroscopy. American Geophysical Union Annual Meeting, New Orleans, LA, Dec 2025. (Contributed poster presentation).
71. *Propson, B., A. Stevenson, D.R. Zak, A.T. Classen, A. Burton, and **Z.B. Freedman**. 2025. Unearthing Legacy Effects of Anthropogenic Nitrogen Deposition on Microbial Mechanisms Mediating Soil Carbon Storage. American Geophysical Union Annual Meeting, New Orleans, LA, Dec 2025. (Contributed poster presentation).
70. *Chiang, A., **Z.B. Freedman**, A.E. Hartemink, and J. Huang. 2025. Investigating the Responses of Soil Hydraulic Properties to Land Cover and Land Use Change Using in Situ Soil Moisture Measurements and Inverse Modeling. American Geophysical Union Annual Meeting, New Orleans, LA, Dec 2025. (Contributed poster presentation).
69. *Anderson, H., K. Linderman, A.E. Hartemink, **Z.B. Freedman**, and J. Huang. 2025. Using Mid-Infrared Spectroscopy to Assess Heterotrophic Respiration and Organic Matter Fractions of Appalachian Reclaimed Mine and Pasture Soils. CANVAS Annual Meeting (Soil Science Society of America (SSSA)), Salt Lake City, UT, Nov 2025. (Contributed poster presentation).
68. *Pipes, G., and **Z.B. Freedman**. 2025. Elucidating the relative effects of trees and soils on microbial processes related to SOC dynamics across forests of the Great Lakers Region. Ecological Society of America (ESA) Annual Meeting, Baltimore, MD, August 2025. (Contributed oral presentation).
67. ***Z.B. Freedman**. 2025. My winding road to exploring microbial controls on soil C in a changing world. UW-Madison BioHouse Living and Learning Community, Madison, WI, October 2025.
66. *Ghimire, S., Y. Zhang, J. Huang, A. Hartemink, E. Majumder, E. Graham, O. Qafoku, and **Z.B. Freedman**. 2025. Predicting model-relevant microbial functions with proximal soil sensing at the continental scale. MoNet Annual Meeting, Richland, WA, February 2025 (Contributed poster presentation)
65. *Ghimire, S., Y. Zhang, J. Huang, A. Hartemink, E. Majumder, E. Graham, O. Qafoku, and **Z.B. Freedman**. 2024. Predicting model-relevant microbial functions with proximal soil sensing at the continental scale. American Geophysical Union Annual Meeting, Washington, DC, December 2024 (Contributed poster presentation)
64. *Propson, B., W.A. Argiroff, D.R. Zak, and **Freedman, Z.B.**, 2024. Fungal and bacterial decomposers are differentially associated with SOM biochemistry throughout decomposition and these relationships are significantly altered under anthropogenic nitrogen deposition. American Geophysical Union Annual Meeting, Washington, DC, December 2024 (Contributed poster presentation)
63. *Tallamy, C., J. Dawson, E. Silva, P. Simon, and **Z.B. Freedman**. 2024. The strength of root exudate mediated rhizosphere microbiome assembly varies across soil type. Soil Science Society of America (SSSA) Annual Meeting, San Antonio, TX, Nov 2024. (Contributed poster presentation).
62. *Anderson, H., Huang, J., Hartemink, A. and **Z.B. Freedman**. 2024. Exploring the use of proximal and remote sensing for ecological monitoring of soil reclamation efforts. Soil Science Society of America (SSSA) Annual Meeting, San Antonio, TX, Nov 2024. (Contributed poster presentation).

61. *Anderson, H., C. Kelly, J. Schuler, and **Z.B. Freedman**. 2024. Microbial controls on soil organic carbon formation and persistence in disturbed and degraded soils in the Appalachian region. Soil Science Society of America (SSSA) Annual Meeting, San Antonio, TX, Nov 2024. (Contributed oral presentation).
60. *Judd, T., Y. Rui, M. Ruark, M. McDaniel, and Z.B. Freedman. 2024. How Do Microbes Contribute to Soil Organic Matter Persistence and Accumulation in Temporally Diverse Cropping Systems across the Midwestern US?. Soil Science Society of America (SSSA) Annual Meeting, San Antonio, TX, Nov 2024. (Contributed oral presentation).
59. *Baiser, B. G. Cagle, J. Bernardin, **Z.B. Freedman**, L. Bittleston, E. Young. 2024. Primary Succession of the *Sarracenia purpurea* Microbiome at a Continental Scale. ESA Annual Meeting, Long Beach, CA, August 2024. (Contributed oral presentation)
58. *Pipes, G., and Z. Freedman. 2024. Cross-kingdom associations shape microbial functional succession and forest soil carbon recovery post-disturbance. Ecological Society of America (ESA) Annual Meeting, Long Beach, CA, August 2024. (Contributed oral presentation).
57. *Propson, B., W.A. Argiroff, D.R. Zak, and Z. Freedman. 2024. Fungal and bacterial decomposers are differentially associated with SOM biochemistry throughout decomposition and these relationships are significantly altered under anthropogenic nitrogen deposition. ESA Annual Meeting, Long Beach, CA, August 2024. (Contributed oral presentation)
56. *Freedman, Z., Y. Zhang, S. Ghimire, J. Huang, T. Whitman, E. Majumder, J. Andrews, and A. Hartemink. 2023. MIR spectroscopy can predict biogeochemically relevant soil microbial properties at the continental scale. American Geophysical Union Meeting, San Francisco, CA. December 2023. (Contributed oral presentation)
55. *Propson, B.E., R. Upchurch, D. Zak, and **Z.B. Freedman**. 2023. Assessing relationships between microbial community diversity and SOM chemistry with implications for C storage in a changing climate. American Geophysical Union Meeting, San Francisco, CA. December 2023. (Contributed oral presentation)
54. *Anderson, H., E. Silva, J. Dawson, P. Simon, and **Z.B. Freedman**. 2023. Assessing the influence of root exudation on soil microbial recruitment across cultivar diversity in organic vegetable production. Soil Science Society of America Annual Meeting, St. Louis, MO. October 2023. (Contributed oral presentation)
53. *Pipes, G., **Z.B. Freedman**. 2023. The effect of forest disturbance and succession on soil carbon recovery. Soil Science Society of America Annual Meeting, St. Louis, MO. October 2023. (Contributed oral presentation)
52. * Judd, T., M. Ruark, **Z.B. Freedman**, and Y. Rui. 2023. Microbial Contribution to C Turnover and Stabilization Altered By Long-Term Cropping System Diversification and Perenniality. Soil Science Society of America Annual Meeting, St. Louis, MO. October 2023. (Contributed oral presentation)
51. * Kelly, C., **Z.B. Freedman**, S. Grover, M. Keck. 2023. Soil response to bioenergy crop production with biochar on reclaimed mine and marginal lands. Soil Science Society of America Annual Meeting, St. Louis, MO. October 2023. (Contributed oral presentation)
49. *Cagle, G., A. McGrew, B.Baiser, S. Record, D. Gravel, T. Poisot, N. Gotelli, L. Bittleston, E. Young, S. Grey, and **Z.B. Freedman**. 2023. Geographic trends in the niche space of microbial consortia within the northern pitcher plant (*Sarracenia purpurea*). Ecological Society of America Annual Meeting, Portland, OR. August 2023. (Contributed oral presentation)
48. *Propson, B.E., G. Cagle, D.R. Zak, R.A. Upchurch, and **Z.B. Freedman**. 2022. Assessing the effect of nitrogen deposition and climatic variation on soil organic matter (SOM) chemistry in northern hardwood forests. SSSA Annual Meeting, Baltimore, MD, November.
47. *Grover, S., J. Fleck, and **Z.B. Freedman**. 2022. Exploring carbon dynamic responses to bio-product feedstock production on reclaimed mined and marginal land in Appalachia, USA. SSSA Annual Meeting, Baltimore, MD, November.

46. *Judd, T., M. Ruark, Y. Rui, and **Z.B. Freedman**. 2022. Microbial contribution to C turnover and stabilization in long-term cropping systems under varying management practices. SSSA Annual Meeting, Baltimore, MD, November.

45. *Mura, J., **Z.B. Freedman**, and L. Raisree. 2022. The influence of soil pH on plant nutrition and microbiome composition in cranberry. SSSA Annual Meeting, Baltimore, MD, 6-9 November.

44. ***Freedman, Z.B.**, J.L. Kane, and E.M. Morrissey. 2022. Harnessing plant-soil-microbe inter-actions to promote sustainable bioenergy agroecosystems on historically mined lands across Appalachia, USA. World Congress of Soil Science, Glasgow, Scotland, August.

43. *Imawoto, C., C. M. Siegert, A. Polinko, J. Granger, K. Poudel and **Z. B. Freedman**. 2022. Sustainable Pathways for Shortleaf Pine (*Pinus enchinata*) Restoration in Uncertain Climates. American Geophysical Union Fall Meeting, Chicago, IL, December.

42. *J. Kane, J. Kotcon, **Z. B. Freedman,** and E. Morrissey. 2022. Fungivorous nematodes drive microbial diversity and carbon cycling in soil. Ecological Society of America Annual Meeting. Montréal, QC, August.

41. ***Freedman, Z.B.**, J. Kane, and E. Morrissey. 2022. Bioenergy agroecosystemsas a sustainable post-mining land use in Appalachia, USA. U.S. Dept. of Energy, Bioenergy Role in Soil Carbon Storage Workshop, Virtual due to COVID-19, March.{Competitive selection process}

40. ***Freedman, Z.B.**, J. Kane and E. Morrissey. 2021. Harnessing the power of the microbiome to improve bioenergy agroecosystem services on severely degraded agricultural lands across Appalachia, USA. American Geophysical Union Fall Meeting, New Orleans, LA, December.

39. *Kane, J., M. Robinson, R. Schartiger, **Z.B. Freedman**, L.M. McDonald, J. Skousen, and E.M. Morrissey. 2021. Harnessing the power of the soil microbiome to enhance bioproduct agroecosystem sustainability. Soil Science Society of America Annual Meeting. Salt Lake City, UT. (Contributed poster presentation)

38. *Kane, J., M. Robinson, **Z.B. Freedman**, L.M. McDonald, J. Skousen, and E.M. Morrissey. 2021. Integrating the ecology of the soil microbiome into our understanding of bioproduct agroecosystem productivity and sustainability. Ecological Society of America Annual Meeting. Virtual due to COVID-19. (Contributed oral presentation)

37. *Martin, G., E.M. Morrissey, W. Carson, and **Z.B. Freedman**. 2021. Legacy effects of fire continue to shape the soil microbiome in an eastern deciduous forest. Ecological Society of America Annual Meeting. Virtual due to COVID-19. (Contributed oral presentation)

36. ***Freedman, Z.B.** 2020. Can soil microbes save the world? Leaning on soil microbes to enhance damaged ecosystems of the present and to improve predictions of future environmental change. NCERA59: Soil Organic Matter: Formation, Function and Management Annual Meeting. Virtual due to COVID-19. (Contributed oral presentation)

35. *Piñeiro, J., C. Dang^{+}, S. Blazewicz, P. Weber, **Z.B.Freedman**, E.R. Brzostek, and E.M. Morrissey. 2020. Chronic nitrogen deposition does not alter microbial carbon use efficiency in AM and ECM soils, but reduces nitrogen use efficiency in both soils. Ecological Society of America Annual Meeting, Virtual due to COVID-19. (Contributed oral presentation)

34. *Kane, J., E.M. Morrissey, J. Skousen, and **Z.B. Freedman**. 2020. Soil microbial succession following surface mining is governed primarily by deterministic factors. Ecological Society of America Annual Meeting, Virtual due to COVID-19. (Contributed oral presentation)

33. *Martin, G., E.M. Morrissey, W. Carson, and **Z.B. Freedman**. 2020. Soil microbial and organic matter resilience to historical disturbance regimes in an eastern deciduous forest. Ecological Society of America Annual Meeting, Virtual due to COVID-19. (Contributed oral presentation)

32. *Martin, G., **Z.B. Freedman**, and W.P. Carson. 2019. Soil microbial and organic matter responses to historical disturbance regimes in an eastern deciduous forest. Ecological Society of America Annual Meeting, Louisville, KY. August. (Contributed oral presentation)
31. ***Freedman, Z.B.** 2019. Soil microbes as Indicators of soil health. West Virginia Univ. Horticulture Seminar Series, Morgantown, WV. March. (Contributed oral presentation)
30. ***Freedman, Z.B.** 2019. Soil microbes as indicators of soil health. WVU Davis College and Extension Research Symposium, Morgantown, WV. March. (Contributed oral presentation)
29. *Mayfield, B., J. Skousen, and **Z.B. Freedman**. 2019. Mine reclamation using bioenergy crops: An investigation into plant-microbe interactions in switchgrass agroecosystems. Department of Energy Joint Genome Institute Users Meeting, San Francisco, CA. March. (Contributed poster presentation)
28. *Koos, J., **Z.B. Freedman**, T. Griggs, and C Kelly. 2018. Defoliation strategies influence soil carbon dynamics and nitrous oxide emission potential in perennial pastures. Northeast Agricultural and Biological Engineering Conference, Edgewood, MD. July. (Contributed poster presentation)
27. *Kane, J., J. Skousen, and **Z.B. Freedman**. 2018. Restoration of the soil microbiome following mine land reclamation. National Association of Abandoned Mine Land Programs Annual Meeting, Williamsburg, VA. September. (Contributed oral presentation)
26. *Mayfield, B., J. Skousen, and **Z.B. Freedman**. 2018. Mine Reclamation using Bioenergy Crops: An investigation into plant-microbe interactions of switchgrass (*Panicum virgatum*). National Association of Abandoned Mine Land Programs Annual Meeting, Williamsburg, VA. September. (Contributed oral presentation)
25. *Carrara, J., E.M. Morrissey, **Z.B. Freedman**, and E.R. Brzostek. 2018. Nitrogen fertilization increases carbon use efficiency of soil microbial communities across 10 long-term N fertilization studies. American Geophysical Union Fall Meeting. Washington DC. December. (Contributed oral presentation)
24. *Griggs, T.C., M.L. Satterfield, J.M. Koos, **Z.B. Freedman**, and C.L. Kelly. 2018. Productivity of Cool-Season Perennial Mixtures Defoliated at Leaf Areas Corresponding to Continuous and Rotational Stocking. International Soils Meeting (ASA, CSSA, SSSA). Baltimore, MD. November. (Contributed oral presentation)
23. *Martin, G., C. Dang^{+}, J. Hubbart, E. Kellner, E.M. Morrissey, and **Z.B. Freedman**. 2018. The role of land use in shaping stream sediment microbial community composition. Ecological Society of America Annual Meeting, New Orleans, LA. August. (Contributed oral presentation)
22. *Entwistle, E.M., K.J. Romanowicz, W.A. Argiroff, **Z.B. Freedman**, J.J. Morris, and D.R. Zak. 2018. Anthropogenic N deposition alters the composition of expressed class H fungal peroxidases ASM Microbe Annual Meeting, Atlanta, GA. June. (Contributed oral presentation)
21. *Kane, J., J. Skousen, and **Z.B. Freedman**. 2018. Restoration of the Soil Microbiome Following Mine Land Reclamation, American Society of Mining and Reclamation Annual Meeting, St. Louis, MO June. (Contributed poster presentation)
20. *Mayfield, B., J. Skousen, and **Z.B. Freedman**. 2018. Mine reclamation using bioenergy crops: An investigation into plant-microbe interactions of switchgrass (*Panicum virgatum*). Department of Energy Joint Genome Institute Users Meeting, San Francisco, CA. March. (Contributed poster presentation)
19. ***Freedman, Z.B.**, K.J. Romanowicz, R.A. Upchurch, W.A. Argiroff, and D.R. Zak. 2017. Anthropogenic N deposition suppresses saprotrophic fungal activity across a northern hardwood forest ecosystem. Argonne National Lab Soil Metagenomics Meeting, Argonne, IL. November. (Contributed oral presentation)

18. ***Freedman, Z.B.** 2017. A Potential Mechanism Fostering Ecosystem Carbon Storage Under Future Rates of Nitrogen Deposition. Eastern Deciduous Forest Symposium, Rector, PA. May. (Contributed oral presentation)
17. ***Freedman, Z.B.** 2017. Anthropogenic N deposition suppresses saprotrophic fungal activity across a northern hardwood forest ecosystem. West Virginia Univ.-Forest Service Seminar Series, Morgantown, WV. April. (Contributed oral presentation)
16. ***Freedman, Z.B.**, K.J. Romanowicz, R.A. Upchurch, W.A. Argiroff, and D.R. Zak. 2017. Anthropogenic N deposition suppresses saprotrophic fungal activity across a northern hardwood forest ecosystem. Ecological Society of America Annual Meeting, Portland, OR. August. (Organized oral presentation)
15. *DeForest, J.L., and **Z.B. Freedman**. 2017. A six-year longitudinal study of phosphorus enrichment on soil enzymes in acidic forest soils. American Geophysical Union Fall Meeting, New Orleans, LA. December. (Contributed oral presentation)
14. ***Freedman, Z.B.**, R.A. Upchurch, D.R. Zak, and L.C. Cline. 2016. Anthropogenic N deposition slows decay by favoring bacterial metabolism: Insights from metagenomic analyses. Ecological Society of America Annual Meeting, Ft. Lauderdale, FL. August. (Contributed oral presentation)
13. *Romanowicz, K.J., **Z.B. Freedman**, and D.R. Zak. 2016. Soil moisture constraints differentiate metabolically active microorganisms from the total community in forest soils. Ecological Society of America Annual Meeting, Ft. Lauderdale, FL. August. (Contributed poster presentation)
12. ***Freedman, Z.B.**, R. Upchurch, D.R. Zak, and L.C. Cline. 2016. Anthropogenic N deposition slows decay by favoring bacterial metabolism: Insights from metagenomic analyses. Department of Energy Genomic Science Annual Grantees Meeting, Tysons, VA. March. (Contributed poster presentation)
11. ***Freedman, Z.B.**, R.A. Upchurch, D.R. Zak, and L.C. Cline. 2015. Increased soil C storage under anthropogenic N deposition: lignocellulolytic baterial ascendance in a fungal world. Argonne National Lab Soil Metagenomics Meeting, Lisle, IL. November. (Contributed oral presentation)
10. ***Freedman, Z.B.**, and D.R. Zak. 2015. Atmospheric N deposition alters co-occurrence, but not functional potential among saprotrophic bacterial communities. Ecological Society of America Annual Meeting, Baltimore, MD. August. (Organized oral session)
9. ***Freedman, Z.B.**, and D.R. Zak. 2014. Dispersal limitation and environmental filtering of bacterial communities along a long-term glacial chronosequence. Ecological Society of America Annual Meeting, Sacramento, CA. August. (Contributed poster presentation)
8. *Upchurch, R.A., **Z.B. Freedman**, K.J. Romanowicz, and D.R. Zak. 2014. Does chronic nitrogen deposition alter the functional potential of soil microbial communities in northern hardwood forests? Argonne National Lab Soil Metagenomics Meeting, St. Charles, IL. October. (Contributed poster presentation)
7. *Romanowicz, K.J., **Z.B. Freedman**, and D.R. Zak. 2014. Chronic nitrogen deposition affects the active bacteria in a northern hardwood forest. Argonne National Lab Soil Metagenomics Meeting, St. Charles, IL. October. (Contributed poster presentation)
6. ***Freedman, Z.B.**, and D.R. Zak. 2014. Dispersal limitation and environmental filtering of bacterial communities along a long-term glacial chronosequence. Argonne National Lab Soil Metagenomics Meeting, St. Charles, IL. October. (Contributed oral presentation)
5. *Upchurch, R.A., **Z.B. Freedman**, K.J. Romanowicz, and D.R. Zak. 2014. Does chronic nitrogen deposition alter the functional potential of soil microbial communities in northern hardwood forests? Ecological Society of America Annual Meeting, Sacramento, CA. August. (Contributed poster presentation)

4. ***Freedman, Z.B.**, and D.R. Zak. 2014. A Bacterial Role in Lignin Decomposition Under Future Rates of Nitrogen Deposition. Department of Energy Genomic Science Annual Grantee's Meeting, Arlington, VA. February. (Contributed poster presentation)
3. ***Freedman, Z.B.**, S.D. Eisenlord, D.R. Zak., K. Zue, X. He, and J. Zhou. 2013. Chronic atmospheric N deposition alters the composition and function of saprotrophic soil bacteria. Ecological Society of America Annual Meeting, Minneapolis, MN. August. (Contributed oral presentation)
2. ***Freedman, Z.B.**, and D.R. Zak, 2012. Suppression of N cycle functional genes in response to chronic atmospheric N deposition. Ecological Society of America Annual Meeting, Portland, OR. August. (Contributed poster presentation)
1. ***Freedman, Z.B.**, and T. Barkay. 2011. Mercury resistance and mercuric reductase activity among chemotrophic thermophilic Aquificae. American Society for Microbiology Annual Meeting, New Orleans, LA

POPULAR MEDIA

2026 Interview with Gwen Pipes about environmental issues related to dryland farming. SevenFiftyDaily. Accessible: https://daily.sevenfifty.com/the-science-behind-dry-farming/

2024 Interview with Brooke Propson about her recent publication (PhD Student, Freedman Lab), UWMadScience. Accessible: https://www.instagram.com/reel/DGdfEP0Rk8C/?hl=en

Related Ecological Society of America Press Release: https://esa.org/blog/2024/11/07/october-research-news-from-the-ecological-society-of-america-2/

2022 Interview, The Badger Variety Hour. 91.7 FM WSUM Accessible: https://open.spotify.com/episode/23TGF2MRRGL7wjGtBi6mNZ?si=d0ylNebtTJKmSUg_YMKmJw

2021 "Healthy Microbes Make Healthy Soil" Interview, Midwest Farm Report. Accessible: https://www.midwestfarmreport.com/2021/08/28/healthy-microbes-make-healthy-soil/

2019 **"**This plant could fix damage to our land and economy, says WVU researchers" Interview, WBOY, Bridgeport, WV. Accessible: https://www.wboy.com/news/local/monongalia-and-preston/this-plant-could-fix-damages-to-our-land-and-economy-says-wvu-researchers/

PROFESSIONAL ACTIVITIES

Member: American Geophysical Union, American Society for Microbiology, Ecological Society of America, Soil Science Society of America

Editorial Board Member: FEMS Microbiology Ecology.

Ad-hoc Manuscript Reviewer: Applied and Environmental Microbiology, Applied Microbiology and Biotechnology, Biochemical Journal, Biogeochemistry, Biological Invasions, Ecological Processes, Ecosphere, FEMS Microbiology Ecology, Forest Ecology and Management, Frontiers in Microbiology, Functional Ecology, Fungal Ecology, Geoderma, Global Change Biology, Global Ecology and Biogeography, Journal of the American Society of Mining and Reclamation, mBio, Microbial Ecology, Molecular Ecology, Mycologia, Nature Reviews Microbiology, PLOS Water, PeerJ, Plant and Soil, Science of the Total Environment, Soil Biology and Biochemistry.

Grant Panelist: National Science Foundation, U.S. Department of Energy, U.S. Department of Agriculture

Ad-hoc Proposal Reviewer: National Science Foundation, U.S. Department of Energy, U.S. Department of Agriculture, U.S. Army Corps of Engineers Engineer Research and Development Center, UW-Madison Hatch, UW-Madison VCRGE Research Forward, The Czech Science Foundation (GACR), French National Research Agency, Swiss National Science Foundation.

University Service: University of Wisconsin-Madison: Environmental Sciences Program Committee, Environment and Resources Program Executive Committee, Wisconsin Center for Ecology and the

Environment Executive Committee, Upham Woods Research Advisory Committee, College of Agricultural and Life Science: Research Advisory Committee, Department of Soil and Environmental Science: Administrative Committee, Development Committee, Facilities Committee, Harassment and Discrimination Committee, Diversity, Equity, and Inclusion Committee, King Hall Redecoration Committee. West Virginia University: General Education Foundations Committee, Davis College Special Events Committee, Division of Plant and Soil Sciences Commencement Marshal.

State Service: Member and Chair of the State of Wisconsin Examining Board of Professional Geologists, Hydrologists and Soil Scientists (appointed by Governor Tony Evers, 2024)