

CURRICULUM VITA (abbr)
G. PHILIP ROBERTSON

University Distinguished Professor
Dept. of Plant, Soil, and Microbial Sciences and
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Education

1976 B. A. Hampshire College, Amherst, Massachusetts
1980 Ph.D. Biology (Ecology & Evolutionary Biology), Indiana University (advisor P.M. Vitousek)

Professional Experience

1985-now Assistant, Associate, Professor, and University Distinguished Professor, Dept. of Plant, Soil, and Microbial Sciences and W.K. Kellogg Biological Station, Michigan State University
1981-1985 Postdoctoral Research Associate, Dept. of Crop and Soil Sciences and Dept. of Microbiology and Public Health, Michigan State University (advisor J.M. Tiedje)
1980-1981 SCOPE-Mellon Postdoctoral Fellow, UNEP International Nitrogen Unit, Royal Swedish Academy of Sciences, Stockholm (advisor T. Rosswall)

Primary Grant Support (past 3 years)

current DOE Office of Science (Biological and Environmental Sciences Division): Great Lakes Bioenergy Research Center; co-PI with T. Donohue (PI; UW-Madison) and R. Landick (UW-Madison); 60 co-I's. \$125M (2018-2022).
current USDA (ARS): Collaborative Long-term Agricultural Research (LTAR): Ecosystem services from row-crop agriculture; PI with co-PIs S.K. Hamilton, N. Haddad. \$1.5M (2020-2022).
current NSF (Division of Environmental Biology): The ecological significance of nitrogen fixation in perennial grasses; co-PI with S.S. Roley (PI; Washington State), D. Buckley (Cornell Univ); \$1.1M (2018-2021).
current NSF (Division of Environmental Biology): LTER: KBS-Mechanisms of resilience in agricultural landscapes. Co-PI with N. Haddad (PI), S.E. Evans, S.H. Hamilton, D. A. Landis, J. A. Lau, S. T. Marquart-Pyatt, and S. M. Swinton; \$2.3M (2018-2022).
2020-2021 NSF (Division of Biological Infrastructure): NEON LTAR Workshop: Identifying continent scale questions and approaches for advancing the sustainable intensification of US agriculture. PI; \$98,666 (2021-2022).

Professional Affiliations and Awards

Fellow, AAAS (2015)
Fellow, Soil Science Society of America (2003)
Member of AAAS, AIBS, Soil Science Society of America, American Geophysical Union, Ecological Society of America
Clarivate highly cited researcher 2018+ (Cross-field; Ecology and Environmental Science)

Professional Service (last 5 years)

current Member, National Leadership Team, USDA LTAR Network (from 2019)

Chair, AAAS Section on Agriculture, Food, and Renewable Resources (6,000 members)
 Member, Scientific Advisory Board, Center for Advanced Biofuels and Bioproducts (CABBI),
 University of Illinois (from 2020)
 Member, DOE Office of Science BERAC Subcommittee on Integrative Science
 2021 Program chair, NSF NEON Workshop for Regionalizing Sustainable Intensification
 2010-2021 DOE Office of Science Biological and Environmental Research Advisory Committee (BERAC)
 2020 Program chair and host, LTAR Network Annual Science Meeting (2020)
 2014-2019 Member, Research Committee, USDA Long-term Agricultural Research Network
 2018 Member and workshop organizer, BERAC Subcommittee on Scientific User Research
 Facilities, BER, DOE Office of Science
 2017 Member, External Review Panel, New Zealand Agricultural Greenhouse Gas Research Center
 2017 Lead author and workshop organizer, Energy Sustainability Working Group of the BER Long-
 term Visioning Workshop, DOE Office of Science
 2017 Member, Environmental Defense Fund Workshop on Addressing Nitrogen Losses from
 Agriculture, Washington, D.C.

Editorships

Plant and Soil, Ecology, Ecological Monographs, Biogeochemistry, PNAS (guest)

Invited Presentations (last 5 years)

2022 iFAST Microbial Ecology Symposium (keynote), Oklahoma (virtual; April 2022)

2021 Bayer Crop Science, International Sustainability Group (virtual, Jan 2021)
 Iowa State University Carbon Forum, Ames (virtual, Apr 2021)
 North Central Soil Health Nexus Workshop, Michigan (Sep 2021)
 K12 Climate Series Symposium, Climate Change and Agriculture (virtual; Feb 2021)

2020 US-UK Forum on Sustainable Agriculture, National Academy of Science, Washington DC (Mar 2020)
 Biology Department, Kent State University (Jan 2020)
 Global Challenges in Food, Soil, & Environmental Quality, American Society of Agronomy (Nov 2020)
 North Central Soil Fertility Industry Conference, Des Moines (Nov 2020)

2019 Nobel Nitrogen Symposium, Nobel Research Institute, OK (Mar 2019)
 DOE Bioenergy Research Centers Modeling Workshop, Chicago IL (May 2019)
 CABBI Annual Science Meeting, University of Illinois Urbana-Champaign, (June 2019)
 Ecological Society of America Annual Meeting, Louisville KY (Aug 2019)
 DOE-BETO Bio-Restore Workshop, Chicago IL (Sep 2019)
 IChE Bioenergy Sustainability Symposium, Nashville TN (Oct 2019)
 American Society of Agronomy MegaSymposium, San Antonio TX (Nov 2019)
 Flagship Pioneering, Webinar (Dec 2019)
 Resilience Institute, Indiana University, Bloomington (Apr 2019)

2018 Conservation Research Institute, University of Cambridge, UK (2 talks; July 2018)
 US DOE, Biological and Environmental Research Advisory Committee, Washington DC (Oct 2018)
 GW Leeper Lecture, University of Melbourne (Nov 2018)
 Terrestrial Ecological Research Forum, Ecological Society of Australia, Brisbane (Nov 2018)

2017 University & Industry Consortium Symposium, Baltimore MD (May 2017)
 American Society of Plant Biology Plenary Symposium, Honolulu HI (June 2017)
 National Academies Science Breakthroughs 2030, Washington DC (Aug 2017)
 American Society of Agronomy Bioenergy Symposium, Tampa FL (Oct 2017)
 USDA SARE Extension Academy, Michigan (Sept 2017)
 American Chemical Society Keynote Speaker, Saginaw MI (Oct 2017)
 Kellogg Company Earth Day Speaker, Battle Creek MI (April 2017)

Publications – last 5 years

- Austin, E. E., A. S. Grandy, K. Wickings, M. McDaniel, and **G. P. Robertson**. 2017. Cover crop root contributions to soil carbon in a no-till corn bioenergy cropping system. *Global Change Biology - Bioenergy* 9:1252-1263.
- Izaurrealde, C., W. B. McGill, J. Williams, C. Jones, R. Link, D. Manowitz, D. Schwab, X. Zhang, **G. P. Robertson**, and **N. Millar**. 2017. Simulating microbial denitrification with EPIC: model description and initial testing. *Ecological Modelling* 359:349-362.
- Jones, C. D., X. Zhang, A. D. Reddy, **G. P. Robertson**, and C. R. Izaurrealde. 2017. The greenhouse gas intensity and potential biofuel production capacity of maize stover harvest in the US Midwest. *GCB Bioenergy* 9:1543-1554.
- Kravchenko, A. N., S. S. Snapp, and **G. P. Robertson**. 2017. Field-scale experiments reveal persistent yield gaps in low-input and organic cropping systems. *Proceedings of the National Academy of Sciences USA* 114:926-93.
- Kravchenko, A. N., E. R. Toosi, A. K. Guber, N. E. Ostrom, J. Yu, K. Azeem, M. L. Rivers, and **G. P. Robertson**. 2017. Hotspots of soil N₂O emission enhanced through water absorption by plant residue. *Nature Geoscience* 10:496-500.
- Reimer, A., J. E. Doll, B. Basso, S. T. Marquart-Pyatt, **G. P. Robertson**, D. Stuart, and J. Zhao. 2017. Moving toward sustainable farming systems: Insights from private and public sector dialogues on nitrogen management. *Journal of Soil and Water Conservation* 72:5A-9A.
- Robertson, G. P.**, S. K. Hamilton, B. L. Barham, B. E. Dale, R. C. Izaurrealde, R. D. Jackson, D. A. Landis, S. M. Swinton, K. D. Thelen, and J. M. Tiedje. 2017. Cellulosic biofuel contributions to a sustainable energy future: Choices and outcomes. *Science* 356:eaal2324. doi: 10.1126/science.aal2324
- Ruan, L. and **G. P. Robertson**. 2017. Reduced snowfall accelerates wintertime nitrous oxide (N₂O) fluxes from an agricultural soil in the upper U.S. Midwest. *Ecosystems* 20:917-927. doi: 10.1007/s10021-016-0077-9
- Sanford, G. R., R. D. Jackson, L. G. Oates, **G. P. Robertson**, S. Roley, and K. D. Thelen. 2017. Biomass production a stronger driver of ethanol yield than biomass quality. *Agronomy Journal* 109:1-12.
- Sprunger, C. D., S. W. Culman, **G. P. Robertson**, and S. S. Snapp. 2017. Perennial grain on a Midwest Alfisol shows no sign of early soil carbon gain. *Renewable Agriculture and Food Systems* doi:10.1017/S1742170517000138.
- Sprunger, C. D., L. G. Oates, R. D. Jackson, and **G. P. Robertson**. 2017. Plant community composition influences fine root production and biomass allocation in perennial bioenergy cropping systems of the upper Midwest, USA. *Biomass and Bioenergy* 105:248-258.
- Valdez, Z. P., W. C. Hockaday, C. A. Masiello, M. E. Gallagher, and **G. P. Robertson**. 2017. Soil carbon and nitrogen responses to nitrogen fertilizer and harvesting rates in switchgrass cropping systems. *BioEnergy Research* 10:456-464.
- Yang, Q., X. Zhang, M. Abraha, S. Del Grosso, **G. P. Robertson**, and J. Chen. 2017. Enhancing the soil and water assessment tool model for simulating N₂O emissions of three agricultural systems. *Ecosystem Health and Sustainability* 3:e01259.
- Abraha, M., S. K. Hamilton, J. Chen, and **G. P. Robertson**. 2018. Ecosystem carbon exchange on conversion of

- Conservation Reserve Program grasslands to annual and perennial cropping systems. *Agricultural and Forest Meteorology* 253-254:151-160.
- Basso, B., B. Dumont, B. Maestrini, I. Shcherbak, **G. P. Robertson**, J. R. Porter, P. Smith, K. Paustian, P. R. Grace, S. Asseng, S. Bassu, C. Biernath, K. J. Boote, D. Cammarano, G. De Sanctis, J.-L. Durand, F. Ewert, S. Gayler, D. W. Hyndman, J. Kent, P. Martre, C. Nendel, E. Priesack, D. Ripoche, A. C. Ruane, J. Sharp, P. J. Thorburn, J. L. Hatfield, J. W. Jones, and C. Rosenzweig. 2018. Soil organic carbon and nitrogen feedbacks on crop yields under climate change. *Agricultural & Environmental Letters* 3:180026. doi: 10.2134/ael2018.05.0026
- Duncan, D. S., L. G. Oates, I. Gelfand, N. Millar, **G. P. Robertson**, and R. D. Jackson. (in press). Environmental factors function as constraints on soil nitrous oxide fluxes in bioenergy feedstock cropping systems. *Global Change Biology Bioenergy*.
- Hamilton, S. K., M. Z. Hussain, C. Lowrie, B. Basso, and **G. P. Robertson**. 2018. Evapotranspiration response to land cover and climate change in a Midwest U.S. watershed. *Hydrological Processes* 32:655-663.
- Jones, C. D., L. G. Oates, **G. P. Robertson**, and R. C. Izaurralde. 2018. Perennialization and cover cropping mitigate soil carbon loss from residue harvesting. *Journal of Environmental Quality* 47:710-717.
- Kleinman, P. J. A., S. Spiegel, J. R. Rigby, S. C. Goslee, J. M. Baker, B. T. Bestelmeyer, R. K. Boughton, R. B. Bryant, M. A. Cavigelli, J. D. Derner, E. W. Duncan, D. C. Goodrich, D. R. Huggins, K. W. King, M. A. Liebig, M. A. Locke, S. B. Mirsky, G. E. Moglen, T. B. Moorman, F. B. Pierson, **G. P. Robertson**, E. J. Sadler, J. S. Shortle, J. L. Steiner, T. C. Strickland, H. M. Swain, T. Tsegaye, M. R. Williams, and C. L. Walthall. 2018. Advancing the sustainability of U.S. agriculture through long-term research. *Journal of Environmental Quality* 47:1412-1425.
- McGill, B. M., S. K. Hamilton, N. Millar, and **G. P. Robertson**. 2018. The greenhouse gas cost of agricultural intensification with groundwater irrigation in a Midwest US row cropping system. *Global Change Biology* 24:5948-5960.
- Millar, N., A. Urrea, K. Kahmark, I. Shcherbak, **G. P. Robertson**, and I. Ortiz-Monasterio. 2018. Nitrous oxide (N₂O) responds exponentially to nitrogen fertilizer in irrigated wheat in the Yaqui Valley, Mexico. *Agriculture, Ecosystems and Environment* 261:125-132.
- Roley, S. S., D. S. Duncan, D. Liang, A. Garoutte, J. M. Tiedje, R. D. Jackson, and **G. P. Robertson**. 2018. Associative nitrogen fixation (ANF) in switchgrass (*Panicum virgatum*) across a nitrogen input gradient. *PLoS ONE* 13:e0197320.
- Spiegel, S., B. T. Bestelmeyer, D. W. Archer, D. J. Augustine, E. H. Boughton, R. K. Boughton, M. A. Cavigelli, P. E. Clark, J. D. Derner, E. W. Duncan, C. Hapeman, D. H. Harmel, P. Heilman, M. A. Holly, D. R. Huggins, K. King, P. J. A. Kleinman, M. A. Liebig, M. E. Locke, G. W. McCarty, N. Millar, S. B. Mirsky, T. B. Moorman, F. B. Pierson, J. R. Rigby, **G. P. Robertson**, J. L. Steiner, T. C. Strickland, H. M. Swain, B. J. Wienhold, J. D. Wulfhorst, M. A. Yost, and C. L. Walthall. 2018. Evaluating strategies for sustainable intensification of US agriculture through the Long-Term Agroecosystem Research Network. *Environmental Research Letters* 13:034031.
- Sprunger, C. D., S. W. Culman, **G. P. Robertson**, and S. S. Snapp. 2018. How does nitrogen and perenniality influence belowground biomass and nitrogen use efficiency in small grain cereals? *Crop Science* doi: 10.2135/cropsci2018.02.0123.
- Sprunger, C. D. and **G. P. Robertson**. 2018. Early accumulation of active fraction soil carbon in newly established cellulosic biofuel systems. *Geoderma* 318:42-51.
- Abraha, M.*, J. Chen, S. K. Hamilton, and **G. P. Robertson**. 2019. Long-term evapotranspiration rates for rainfed corn vs. perennial bioenergy crops in a mesic landscape. *Hydrological Processes* 34:810-822. doi: 10.1002/hyp.13630
- Abraha, M.*, I. Gelfand, S.K. Hamilton, J. Chen and **G.P. Robertson**. 2019. Carbon debt of field-scale Conservation Reserve Program grasslands converted to annual and perennial bioenergy crops. *Environmental Research Letters* doi: 10.1088/1748-9326/aafc10

- Basso, B., G. Shau, J. Zhang, and **G. P. Robertson**. 2019. Yield stability analysis reveals sources of large-scale nitrogen loss from the U.S. Midwest. *Scientific Reports* 9:5774. doi: 10.1038/s41598-019-42271-1
- Duncan, D. S., L. G. Oates, I. Gelfand, N. Millar, **G. P. Robertson**, and R. D. Jackson. 2019. Environmental factors function as constraints on soil nitrous oxide fluxes in bioenergy feedstock cropping systems. *Global Change Biology Bioenergy* 11:416-426. doi: 10.1111/gcbb.12572.
- Hussain, M. Z., A. K. Bhardwaj, B. Basso, **G. P. Robertson**, and S. K. Hamilton. 2019. Nitrate leaching from continuous corn, perennial grasses, and poplar in the US Midwest. *Journal of Environmental Quality* 48:1849-1855.
- Hussain, M. Z., S. K. Hamilton, B. Basso, A. K. Bhardwaj, K. Thelen, and **G. P. Robertson**. 2019. Evapotranspiration and water use efficiency of continuous maize and maize and soybean rotation in the upper Midwest U.S. *Agricultural Water Management* 221:92-98.
- Kravchenko, A.N., A.K. Guber, B. S. Rasavi, J. Koestel, M.Y. Quigley, **G. P. Robertson**, and Y. Kuzyakov. 2019. Microbial spatial footprint as a driver of soil carbon stabilization. *Nature Communications* 10:3121
- Roley, S.S., C. Xue, S.K. Hamilton, J.M. Tiedje, **G.P. Robertson**. 2019. Isotopic evidence for episodic nitrogen fixation in switchgrass (*Panicum virgatum* L.). *Soil Biology and Biochemistry* 129:90-98.
- Shcherbak, I. and **G. P. Robertson**. 2019. Nitrous oxide (N₂O) from subsurface soils of agricultural ecosystems. *Ecosystems* 22:1650-1663.
- Wang, S., G. R. Sanford, **G.P. Robertson**, R. D. Jackson, and K. D. Thelen. 2019. Perennial bioenergy crop yield and quality response to nitrogen fertilization. *BioEnergy Research* 13: 157-166. doi:10.1007/s12155-019-10072-z.
- Bowles, T. M., M. Mooshammer, Y. Socolar, F. Calderón, M. A. Cavigelli, S. W. Culman, W. Deen, C. F. Drury, A. Garcia Y Garcia, A. C. M. Gaudin, W. S. Harkrom, R. M. Lehman, S. L. Osborne, **G. P. Robertson**, J. Salerno, M. R. Schmer, J. Strock, and A. S. Grandy. 2020. Long-term evidence shows crop rotation diversification increases agricultural resilience to adverse growing conditions in North America. *One Earth* 2:284-293.
- Cusser, S., C. A. Bahlai, S. M. Swinton, **G. P. Robertson**, and N. M. Haddad. 2020. Long-term research needed to avoid spurious trends in sustainability attributes of no-till. *Global Change Biology* doi: 10.1111/gcb.15080
- Gelfand, I., S.K. Hamilton, A.N. Kravchenko, R.D. Jackson, K.D. Thelen, and **G.P. Robertson**. 2020. Empirical evidence for the potential climate benefits of decarbonizing light vehicle transport in the U.S. with bioenergy from purpose-grown biomass with and without BECCS. *Environmental Science & Technology* 54: 2961-2974. doi:10.1021/acs.est.9b07019
- Grace, P., T. J. van der Weerden, D. W. Rowlings, C. Scheer, C. Brunk, R. Kiese, K. Butterbach-Bahl, R. M. Rees, **G. P. Robertson**, and U. M. Skiba. 2020. Global Research Alliance N₂O chamber methodology guidelines: Considerations for automated flux measurement. *Journal of Environmental Quality* doi: 10.1002/jeq2.20124
- Hess, L., E. S. Hinckley, **G. P. Robertson**, and P. A. Matson. 2020. Rainfall intensification increases nitrate leaching from tilled but not no-till cropping systems of the U.S. Midwest. *Agriculture, Ecosystems and Environment* 290:106747.
- Hussain, M. Z., **G. P. Robertson**, B. Basso, and S. K. Hamilton. 2020. Leaching losses of dissolved organic carbon and nitrogen from agricultural soils in the upper US Midwest. *Science of the Total Environment* 734:139379. doi:10.1016/j.scitotenv.2020.139379
- Liang, D., Y. Ouyang, L. K. Tiemann, and **G. P. Robertson**. 2020. Niche differentiation of bacterial versus archaeal soil nitrifiers induced by ammonium inhibition along a management gradient. *Frontiers in Microbiology* 11:568588.
- Reed, D., J. Chen, M. Abraha, **G. P. Robertson**, and K. Dahlin. 2020. The shifting role of mRUE for regulating ecosystem production. *Ecosystems* 23:359-369. doi:10.1007/s10021-019-00407-4
- Roley, S. S., T. C. Ulbrich, and **G. P. Robertson**. 2020. Nitrogen fixation and resorption efficiency differences

- among twelve switchgrass varieties. *Phytobiomes* doi: 10.1094/PBIOMES-11-19-0064-FI
- Ruan, L. and **G. P. Robertson**. 2020. No-till establishment improves the climate benefit of bioenergy crops on marginal grasslands. *Soil Science Society of America* 84:1280-1295. doi: 10.1002/saj2.20082
- Sciusco, P., J. Chen, M. Abraha, C. Lei, **G. P. Robertson**, R. Laforzezza, G. Shirkey, Z. Ouyang, R. Zhang, and R. John. 2020. Spatiotemporal variations of albedo in managed agricultural landscapes: Inferences to global warming impacts (GWI). *Landscape Ecology* doi: 10.1007/s10980-020-01022-8
- Abraha, M., J. Chen, S. K. Hamilton, P. Sciusco, C. Lei, G. Shirkey, J. Yuan, and **G. P. Robertson**. 2021. Albedo-induced global warming impact of Conservation Reserve Program grasslands converted to annual and perennial bioenergy crops. *Environmental Research Letters* 16:084059.
<http://dx.doi.org/10.1088/1748-9326/ac1815>
- Aoda, M. I., A.J.M. Smucker, S.S. Majeed, H.A. Mohammed, F.H. Al-Sahaf, and **G.P. Robertson**. 2021. Novel root zone soil water retention improves production with half the water in arid sands. *Agronomy Journal* 113:2398-2406.
- Belanger, M., C. Vizza, **G. P. Robertson**, and S. S. Roley. 2021. Quantifying and correcting for premature CO₂ loss in short-term carbon mineralization assays. *SOIL* 7:47-52.
- Grace, P. R. and **G. P. Robertson**. 2021. Soil carbon sequestration potential and the identification of hotspots in the eastern Corn Belt of the United States. *Soil Science Society of America Journal* 85:1410-1424.
<https://doi.org/10.1002/saj2.20273>
- Hussain, M. Z., S. K. Hamilton, **G. P. Robertson**, and B. Basso. 2021. Phosphorus availability and leaching losses in annual and perennial cropping systems in an upper US Midwest landscape. *Scientific Reports* 11:20367. <https://doi.org/10.1038/s41598-021-99877-7>
- Kravchenko, A. N., H. Zheng, Y. Kuzyakov, **G. P. Robertson**, and A. K. Guber. 2021. Belowground interplant carbon transfer promotes soil carbon gains in diverse plant communities. *Soil Biology and Biochemistry* 159:108297.
- Liang, D. and **G. P. Robertson**. 2021. Nitrification is a minor source of nitrous oxide (N₂O) in an agricultural landscape and declines with increasing management intensity. *Global Change Biology* 27:5599-5613.
<https://doi.org/10.1111/gcb.15833>
- Lowry, C., **G. P. Robertson**, and D. C. Brainard. 2021. Strip-tillage decreases soil nitrogen availability and increases the potential for N losses in a cover cropped organic system. *Agriculture, Ecosystems & Environment* 319:107524.
- Mosier, S., S. C. Córdova, and **G. P. Robertson**. 2021. Restoring soil fertility on degraded lands to meet food, fuel, and climate security needs via perennialization. *Frontiers in Sustainable Food Systems* 5:706142.
<https://lter.kbs.msu.edu/docs/robertson/mosier-et-al-2021-front-sus-food-sys.pdf>
- O'Neill, B., C. D. Sprunger, and **G. P. Robertson**. 2021. Do soil health tests match farmer experience? Assessing biological, physical, and chemical indicators in the upper Midwestern United States. *Soil Science Society of America Journal* <https://doi.org/10.1002/saj2.20233>.
- Roley, S. S., T. C. Ulbrich, and **G. P. Robertson**. 2021. Nitrogen fixation and resorption efficiency differences among twelve upland and lowland switchgrass cultivars. *Phytobiomes Journal* 5:97-107.
<https://lter.kbs.msu.edu/docs/robertson/role-et-al-2020-phytobiomes.pdf>
- Saha, D., B. Basso, and **G. P. Robertson**. 2021. Machine learning improves predictions of agricultural nitrous oxide (N₂O) emissions from intensively managed cropping systems. *Environmental Research Letters* 16:024004.
- Spawn-Lee, S. A., T. J. Lark, H. K. Gibbs, R. A. Houghton, C. J. Kucharick, C. Malins, R. E. O. Pelton, and **G. P. Robertson**. 2021. Comment on 'Carbon intensity of corn ethanol in the United States: state of the science'. *Environmental Research Letters* 16:118001.
- Udvardi, M., F. E. Below, M. J. Castellano, A. J. Eagle, K. E. Giller, J. K. Ladha, X. Liu, T. M. Maaz, B. Nova-Franco, N. Raghuram, **G. P. Robertson**, S. Roy, M. Saha, S. Schmidt, M. Tegeder, L. M. York, and J. W. Peters. 2021. A research road map for responsible use of agricultural nitrogen. *Frontiers in Sustainable*

Food Systems 5:660155.

Pan, D., I. Gelfand, L. Tao, M. Abraha, K. Sun, X. Guo, J. Chen, **G. P. Robertson**, and M. A. Zondlo. 2022. A new open-path eddy covariance method for nitrous oxide and other trace gases that minimizes temperature corrections. *Global Change Biology* 28:1446-1457.

Robertson, G. P. and A. S. Grandy. 2022. Managing soils as systems in temperate region landscapes. In N. Uphoff and J. Thies, editors. *Biological Approaches to Regenerative Soil Systems*, 2nd edition. CRC Press (in press)

Robertson, G. P. and P. M. Groffman. 2022. Nitrogen transformations. In E. A. Paul and S. D. Frey, editors. *Soil Microbiology, Ecology, and Biochemistry*, 5th edition. Elsevier (in press).

Sciusco, P., J. Chen, V. Giannico, M. Abraha, C. Lei, G. Shirkey, J. Yuan, and **G. P. Robertson**. 2022. Albedo-induced global warming impact at multiple temporal scales within an upper Midwest USA watershed. *Land* 11:283.

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