

Christine D. Sprunger

W.K. Kellogg Biological Station • Department of Plant, Soil, and Microbial Sciences
Michigan State University • Hickory Corners, MI
sprunge5@msu.edu • www.sprungerlab.com

Education

Ph.D. in Crop and Soil Sciences and Ecology, Evolutionary Biology, and Behavior <i>Michigan State University</i>	Dec. 2015
B.S. in Forest Resources, with Honors <i>University of Washington</i>	June 2010
B.A. in Environmental Studies, Minor in Human Rights <i>University of Washington</i>	June 2010

Appointments

Associate Professor of Soil Health <i>Michigan State University</i> <i>W. K. Kellogg Biological Station</i> <i>Department of Plant, Soil, and Microbial Sciences</i> <i>Plant Resilience Institute</i>	July 1 st , 2024- Present
Assistant Professor of Soil Health <i>Michigan State University</i> <i>W. K. Kellogg Biological Station</i> <i>Department of Plant, Soil, and Microbial Sciences</i>	2022- June 30 th , 2024
Assistant Professor of Soil Science and Rhizosphere Processes <i>School of Environment and Natural Resources, The Ohio State University</i> <i>InFACT Discovery Theme</i>	2018-2022
Post-doctoral Research Scientist <i>School of Environment and Natural Resources, The Ohio State University</i>	2018
NSF Post-doctoral Fellow in Biology <i>Agriculture and Food Security Center, Columbia University</i>	2016-2018
National Ford Foundation Pre-Doctoral Fellow <i>Plant, Soil, and Microbial Sciences, Michigan State University</i>	2012-2014

Publications

*denotes Sprunger lab advisee ⁺denotes student co-author/mentee in collaborative lab

Under Review

Martin, T.K. and **Sprunger, C.D.** *Under Review*. Long-term maintenance of regenerative agriculture enhances soil food webs and drives carbon accumulation. *Ecology Letters*.

Du Preez, G.,⁺Loggenberg, A., Fourie, D., Marcelo-Silva, Joao., *Martin, T.K., Ramphisa-Nghondzweni, D., Smith, H., **Sprunger, C.D.** *Under Review*. Context matters: Divergent outcomes of soil ecosystem status under different conservation agriculture systems. *Agriculture, Ecosystems, and the Environment*.

⁺Wanderson, N.; **Sprunger, C.D.**; de Vasconcelos Gomes, V. Lindsey, A. *Under review*. Water temperature in simulated flooding experiments alter corn N uptake and N dynamics. *Journal of Environmental Quality*.

Arceno, MA., Menkoff, M., Kawa, N.C., *Singh, P., and **Sprunger, C.D.** *Under review*. Adapting annual and perennial systems to climate change: How Midwestern farmers manage the impacts of extreme weather. *Environmental Research: Food Systems*.

Published

29. Oldfield, E.E., Lavalley, J., Blesh, J., Bradford, M., Cameron-Harp, M., Cotrufo, F.M., Eagle, A.J., Eash, L., Even, R., Kuebbing, S., Kort, E.A., Lark, T.J., Latka, C., Lin, Y., Machmuller, M.B., O'Neill, B., Raffeld, A.M., RoyChowdhury, T., Rudek, J., Sanderman, J., **Sprunger, C.D.**, Uludere Argon, N., Vidal, M., Woolf, D., Zelikova, T.J., and Gordon, D.R. 2024. Greenhouse gas mitigation on croplands: clarifying the debate on knowns, unknowns, and risks to move forward with effective management interventions. *Carbon Management Journal*. 15, 1, 2365896. <https://doi.org/10.1080/17583004.2024.2365896>.

28. ⁺Agyei, B. **Sprunger, C.D.**, Anderson, E. Curell, C., Singh, M. 2024. Farm-level variability in soil biological health indicators in Michigan is dependent on management and soil properties. *Soil Science Society of America Journal*, 88: 326-338. <https://doi.org/10.1002/saj2.20630>

27. *Singh, P., Kawa, N., **Sprunger, C.D.** 2024. More questions than answers: Ohio farmers perceptions of novel soil health data and their utility for on-farm management. *Agroecology and Sustainable Food Systems*, 48 (1), 74-92. <https://doi.org/10.1080/21683565.2023.2270928>

26. *Naasko, K. *Martin, T.K., *Murray, J. and *Mann, M, *Mammana, C., **Sprunger, C.D.** 2024. Soil protein: a key indicator of soil health and nitrogen management. *Soil Science Society of America Journal*. 88, 89-108. <https://doi.org/10.1002/saj2.20600>

- **Featured in CSA News March 2024 Issue:**
<https://doi.org/10.1002/csan.21246>

25. **Sprunger, C.D.** and *Martin, T.K. 2023. An integrated approach to assessing soil biological health. *Advances in Agronomy*. 182, 131-16. <https://doi.org/10.1016/bs.agron.2023.06.003>

24. *Martin, T.K. and **Sprunger, C.D.** 2023. Nematodes require space: The relationship between nematode community assemblage and soil carbon across varying aggregate fractions. *Geoderma*. 436, 116536. <https://doi.org/10.1016/j.geoderma.2023.116536>

23. **Sprunger, C.D.**, Lindsey, A., *Lightcap, A. 2023. Above and belowground linkages during extreme moisture excess: Leveraging knowledge from natural ecosystems to better understand implications for row-crop agroecosystems. *Journal of Experimental Botany*, 74 (9). <https://doi.org/10.1093/jxb/erad045>

- Invited paper for special issue on Enhancing the Resilience of Plant Systems to Climate Change
- USDA Funded flooding experiment photo selected for cover

22. †Leiva Soto, A. Culman, S.W., Herms, C., C., **Sprunger, C.D.**, Doohan, D. 2023. Managing soil acidity vs. soil Ca:Mg ratio: what is more important for crop productivity? *Crop, Forage, and Turfgrass Management*, 9 (1), e20210. <https://doi.org/10.1002/cft2.20210>

21. *Martin, T.K. and **Sprunger, C.D.** 2022. Sensitive measures of soil health reveal carbon stability across a management intensity and plant biodiversity gradient. *Frontiers in Soil Science*. 2:7. <https://doi.org/10.3389/fsoil.2022.917885>

- Invited paper for special issue on Soil Health and Security.

20. *Martin, T. and **Sprunger, C.D.** 2022. Soil food web structure and function in annual row-crop systems: How can nematode communities infer soil health? *Applied Soil Ecology*, 178, 104553. <https://doi.org/10.1016/j.apsoil.2022.104553>

19. Wade, J., Culman, S.W., Gasch, C.K., Lazcano, C., Maltais-Landry, G., Margenot, A. J., *Martin, T.K., Potter, T. S., Roper, W.R., Ruark, M.D., **Sprunger, C.D.**, Wallenstein, M.D. 2022. Rigorous, empirical, and quantitative: a proposed pipeline for soil health assessment. *Soil Biology and Biochemistry*, 170, 108710. <https://doi.org/10.1016/j.soilbio.2022.108710>

18. *Martin, T., Culman, S.W., and **Sprunger, C.D.** 2022. Quality or Quantity? Determining the impact of fine root traits on soil health in row-crop agriculture. *Journal of Soil Science and Plant Nutrition*, 22, 2322-2333. <https://doi.org/10.1007/s42729-022-00811-1>

17. *Martin, T., Wade, J. *Singh, P., and **Sprunger, C.D.** 2022. The integration of nematode communities into the soil biological health framework by factor analysis. *Ecological Indicators*. 136, 108676. <https://doi.org/10.1016/j.ecolind.2022.108676>

16. *Martin, T. and **Sprunger, C.D.** 2021. Belowground dynamics influence nitrogen cycling and crop productivity in diversified corn systems. *Frontiers in Sustainable Food Systems*. 5:705577. <https://doi.org/10.3389/fsufs.2021.705577>

- Invited paper for special issue on Ecological Nutrient Management as a Pathway to Zero Hunger.

15. Mestelan, S., Smeck, N., **Sprunger, C.D.**, [†]Dyck, A., and Dick, W. 2021. Four decades of continuously applied tillage or no-tillage on soil properties and soil morphology. *Agrosystems, Geosciences, & Environment*, 4(3), e20195. <https://doi.org/10.1002/agg2.20195>

14. **Sprunger, C.D.**, Culman, S.W., Deiss, L. Brock, C., and Jackson-Smith, D. 2021. Which management practices influence soil health in Midwest organic corn systems? *Agronomy Journal*. 113:5, 4201-4219. <http://dx.doi.org/10.1002/agj2.20786>

13. Chaganti, V.N., Culman, S.W., Herms, C. **Sprunger, C.D.**, Brock, C. [†]Leiva Soto, A., and Doohan, D. 2021. Base cation saturation ratios, soil health, and yield in organic field crops. *Agronomy Journal*. 113:5, 4190-4200. <https://doi.org/10.1002/agj2.20785>

12. Culman, S.W., Brock, C., Doohan, D., Jackson-Smith, D., Chaganti, V.N., Herms, C., Kleinhenz, M., **Sprunger, C.D.**, and Spargo, J. 2021. Base cation saturation ratios vs. sufficiency level of nutrients: a false dichotomy in practice. *Agronomy Journal*, 113:6, 5623-5634. <https://doi.org/10.1002/agj2.20787>

11. ^{*}Martin, T. and **Sprunger, C.D.** 2021. A meta-analysis of nematode community composition across soil aggregates: Implications for soil carbon dynamics. *Applied Soil Ecology*, 168, 104143. <https://doi.org/10.1016/j.apsoil.2021.104143>

10. O'Neill, B.E., **Sprunger, C.D.**, and Robertson, G.P. 2021. Do soil health tests match farmer experience? Assessing biological, physical, and chemical indicators in the upper Midwest United States. *Soil Science Society of America Journal*, 85, 903-918. <https://doi.org/10.1002/saj2.20233>.

- **Featured in CSA News June 2021 Issue:**
<https://access.onlinelibrary.wiley.com/doi/10.1002/csan.20463>

9. Lin, E., **Sprunger, C.D.**, and [†]Hwang, J. 2021. The Farmer's Battlefield: Traditional ecological knowledge and unexploded ordnances in Cambodia. *Agriculture and Human Values*, 38, 827-837. <https://doi.org/10.1007/s10460-021-10195-0>.

8. **Sprunger, C.D.** ^{*}Martin, T.K., and ^{*}Mann, M. 2020. Systems with greater perennality and crop diversity enhance soil biological health. *Agricultural and Environmental Letters*, 5, e20030. <https://doi.org/10.1002/acl2.20030>.

- **Awarded 'Featured Article' for issue**
- **Featured in CSA News March 2021 Issue:**
<https://access.onlinelibrary.wiley.com/doi/full/10.1002/csan.20414>.
- **Named 2022 Outstanding Paper of the Year:**
<https://www.agronomy.org/publications/awards/>

7. **Sprunger, C.D.**, Culman, S.W., Peralta, A.L. DuPont, S.T., Lennon, J.T., and Snapp, S.S. 2019. Perennial grain crop roots and nitrogen management shape soil food webs and soil carbon dynamics. *Soil Biology and Biochemistry*, 137, 107573. <https://doi.org/10.1016/j.soilbio.2019.107573>
6. **Sprunger, C.D.**, Culman, S.W., Thuita, M., Palm, C.A., and Vanlauwe, B. 2019. Long-term application of low C:N residues enhances maize yield and soil nutrient pools across Kenya. *Nutrient Cycling in Agroecosystems*, 114, 261-276. <https://doi.org/10.1007/s10705-019-10005-4>
5. *Pugliese, J.Y., Culman, S.W., and **Sprunger, C.D.** 2019. Grain and forage harvest of a perennial grain crop, *Kernza (Thinopyrum intermedium)*, increases its productivity and soil nutrient cycling. *Plant and Soil*, 437, 241-254. <https://doi.org/10.1007/s11104-019-03974-6>
4. **Sprunger, C.D.**, Culman, S.W., Robertson, G.P., and Snapp, S.S. 2018. How does nitrogen and perennality influence belowground biomass and nitrogen use efficiency in small grain cereals? *Crop Science*, 58, 2110-2120. <https://doi.org/10.2135/cropsci2018.02.0123>
3. **Sprunger, C.D.**, Culman, S.W., Robertson, G.P., and Snapp, S.S. 2018. Perennial grain on a Midwest Alfisol shows no sign of early soil carbon gain. *Renewable Agriculture and Food Systems*, 33, 360–372. <https://doi.org/10.1017/S1742170517000138>
2. **Sprunger, C.D.** and Robertson, G.P. 2018. Early accumulation of active fraction soil carbon in newly established cellulosic biofuel systems. *Geoderma*, 318, 42-51. <https://doi.org/10.1016/j.geoderma.2017.11.040>
1. **Sprunger, C.D.**, Oates, L.G., Jackson, R.J., and Robertson, G.P. 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. <http://dx.doi.org/10.1016/j.biombioe.2017.07.007>.

Book Chapters

du Preez, G., Campos-Herrera, Daneel, M., Korthals, G., Henrik Schmidt, **Sprunger, C.D.** Nematodes as bioindicators of ecosystem functions under different land uses. *In Revision*. Nematodes as Environmental Bioindicators: from theory to practice. (2nd Edition).

Sprunger, C.D. *Martin, T.K., and *Singh, P. Integrating perennials into agroecosystems for enhanced soil biodiversity and long-term sustainability. 2024. Biodiversity and Bioeconomy. K. Singh (Ed.). Elsevier, Amsterdam, Netherlands. <https://shop.elsevier.com/books/biodiversity-and-bioeconomy/singh/978-0-323-95482-2>

Published Datasets

Sprunger, C. D. and Robertson, G. P. 2018. Data from: Early accumulation of active fraction soil carbon in newly established cellulosic biofuel systems. *Dryad Digital Repository*. <https://doi.org/10.5061/dryad.7jq46>.

Extension Materials

Culman, S.W., Deiss, L., Fortune, B., Gingery, M, *Mann, M. **Sprunger, C.D.**, Hawkins, E., Brown, C., Hurriso, T., Fulford, T., Francis,D., Lindsey, L.E. Bergefurd, B. 2022. [Baseline Assessment of Soil Health in Ohio](#). The Ohio State University Extension.

Competitive Grants

Submitted Grant Proposals:

Blesh, J., Asher, A. **Sprunger, C.D.** Understanding the outcomes of improved soil health to accelerate conservation in the Western Lake Erie Basin. MDARD. Subaward to MSU. \$1,411,282.38. Submitted March 20th.

Schultheis, E., Haddad, N., and Sprunger, C.D. MiSTRIPS: A collaborative program to improve Michigan agricultural outcomes with prairie conservation plantings. National Fish and Wildlife Foundation-Conservation Partners Program. \$690,666 Submitted. February 26th.

Narenda, D., Dong, Y., Mahapatra, N, and **Sprunger, C.D.** Enhancing soil health: An AI based LcGas System of Fertilizer Application Optimization through GHG Flux Measurement. USDA CIG. \$2,065,024. Submitted November 3rd, 2023.

Bronikowski, A., F. Janzen, S. Roy, **Sprunger, C.D.** RaMP: Sustaining biodiversity through integrative Training, Interning, and Mentoring (STIM-bio): A field station and STEM stakeholders working together to grow a diverse workforce. NSF RaMP. \$2,999,999. Submitted January 17, 2024.

Active grants:

Sprunger, C.D., Bhowmik, A. 2024. MSU and A&T Exchange: Training and mentorship in nematology to enhance soil health assessments across the Southeastern United States. MSU and A&T Research Exchange.

Sprunger, C.D. Robertson, G.P., Basso, B., Charles, C., DeDecker, J., Jean, M., Kravchenko, A.N., Laporte, J., Marquate-Pyatt, S., Sears, M., Singh, M., Ulbrich, T., Wilke, B. 2024-2027. MSU Agricultural Climate Resiliency Program. \$1,249,599.

Haddad, N., Evans, S., and **Sprunger, C.D.** 2024-2027. Diversified cropping systems for biodiversity and ecosystem services. USDA NIFA. \$749,999.71.

Wessel, B. and **Sprunger, C.D.** 2024-2025. Establishing Soil and Plant Nutrient Laboratory data as a research resource. Project Green. \$19,488.45.

Sprunger, C.D. Robertson, G.P. and Evans, S. 2023-2026. MSU/Syngenta Soil Health Partnership. Syngenta. \$350,000.

Sprunger, C.D., Shulthies, E., and Docherty, K. 2023-2026. Exploring the efficacy of prairie strips as a soil health promoting practice. North Central SARE. \$119,055.

Sprunger, C.D. Expand knowledge of how changes in soil food web dynamics impact overall soil health outcomes by sampling NCSS characterized pedons. 2023-2026. USDA NRCS Soil Survey. \$489,613.

Sprunger, C.D., Haddad, N.K., and McDaniel, M.D. 2023-2025. Building a collaborative program to promote biodiversity and soil health in row-crop agriculture using prairie strip conservation. Doug and Maria Bayer New Initiatives Fund for Sustainable Agriculture 2023. \$49,852.

Haddad, N., Basso, B., Evans, S., Kravchenko, A., Landis, Lau, J., Robertson, G.P. **Sprunger, C.D.**, Zarnetske, P. 2022 – 2028. LTER: KBS – Revealing ecological and social mechanisms of resilience in agroecological systems. NSF LTER. \$7,650,000.

Sprunger, C.D., Cordova, C., Lin, L. 2022-2024. Assessing a suite of indicators to predict soil carbon trajectories in agricultural systems. Environmental Defense Fund. \$298,433.

Jackson-Smith, D., M. Chiavegato, S. Culman, S.W. Lyon, S., Parker, T., Shah, A., and **Sprunger, C.D.** 2021-2025. Comparing Environmental Tradeoffs and Synergies of Alternative Modes of Integrating Livestock into Cash Grain Cropping Systems. USDA NIFA IDEAS. \$999,408.

Lindsey, A. and **Sprunger, C.D.** 2021-2026. After the Flood: Impacts on Rhizosphere Biology, Nutrient Cycling, and Corn Growth and Yield. USDA AFRI. \$500,000.
Subaward to Michigan State University for years 2022-2026.

Culman, S.W., **Sprunger, C.D.**, M. Sulc, B. Ward, R. Hayden, J. Jungers, M. Ryan, T. Crews, and L. DeHaan. 2019-2024. Organic dual-use perennial grain crops: Pathways to profitability and soil health. USDA OREI. \$1,776,905.

Completed Grants:

Lipschitz, F., B. Flemming, S. Inwood, S. Karle, B. Milligan, Z. Plakias, **C.D. Sprunger**, and P. Summerlin. 2019-2020. Identifying opportunities for Landscape Architectural Engagement with Climate Smart Agriculture. InFACT Linkage and Leverage Grant 2019. \$34,613.

Martin, K*. and **C.D. Sprunger.** 2020-2021. The use of nematodes and enzyme activities for on-farm soil biological health tests. USDA North Central Sustainable Agriculture Research and Education Graduate Student Grant. \$10,875.

Sprunger, C.D. 2020-2021. Nematode Quantification in Ohio Soybean Fields. Ohio Soybean Council. \$35,000.

Sprunger, C.D., N.C. Kawa, J.E. Doll, P. Singh. 2020-2021. How can soil health indicators inform farmers' soil conservation practices and climate adaptation strategies? InFACT Linkage and Leverage Grant. \$34,153.

Sprunger, C.D. 2019-2021. Rainfall extremes and rhizosphere dynamics: Implications for soil health and crop productivity. OARDC Seeds. \$49,987.

Lindsey, L. E. Hawkins, and **Sprunger, C.D.** 2019-2020. Identifying the cause of soybean self-thinning using Climate FieldView™. Bayer Crop Science. \$68,512.

Baethgaen, W. and **Sprunger, C.D.** 2016. Developing and assessing soil carbon management and restoration recommendations for climate smart agriculture: A pilot study with smallholder farmers in Tanzania. Columbia University, The Earth Institute: Cross-Cutting Initiative. \$30,000.

Sprunger, C.D. and G.P. Robertson. 2015. Biodiversity effects on soil carbon gain in annual and perennial cropping systems. USDA Sustainable Agriculture Research and Education Program; 2014-2015. \$6,382.

Submitted but unsuccessful grant proposals:

Lebeis, S., Curell, C., Gilbert, K., Jean, M., Kirshenbaum, S., Lowry, D., Rhee, S., Singh, M., **Sprunger, C.D.**, Steinke, K. Advancing towards a robust assessment of the effects of biostimulants on soil and plant health. MSU Agricultural Climate Resiliency Program. \$1,250,000. Submitted March 1st.

Haddad, N., Charles, C., Evans, S., Marquat-Pyatt, S., Schultheis, E., Sprunger, C.D., Sullivan, L. Diversified cropping systems for biodiversity and climate resilience. MSU Agricultural Climate Resiliency Program. \$1,250,000. Submitted February 28th.

Franco, A. and **Sprunger, C.D.** Harnessing soil animal diversity to promote multifunctionality and guide soil health management in agroecosystems. USDA NIFA. \$747,067. Submitted September 12th, 2023.

Sprunger, C.D., E. Schultheis. Collaborative Research: Promoting Soil Biodiversity and Ecosystem Function Using Prairie Conservation Corridors. NSF: Partnership to Advance Conservation Science and Practice. \$308,416. Submitted with Western Michigan University and Edward Lowe Foundation. Submitted: Oct. 11, 2022.

Chiavegato, M., N. Bello, S. Lyon, **C. Sprunger**. Effects of grazing and flooding on nitrogen stocks and losses. NC SARE. \$249,984. Submitted March 2022.

Sprunger, C.D. Bridging soil biodiversity and soil health through the quantification of nematodes and other dynamic soil properties. Soil Science Collaborative Research. USDA NRCS. \$265,680.35. Submitted April 2022 via Michigan State University.

V. Roman-Ryna, J. Jacobs, **C.D. Sprunger**. USDA AFRI. Assessing the impact of carbon availability on soil food webs in rice ecosystems for enhanced crop productivity and ecological function. \$849,726.

Sprunger, C.D. Linking farmer management decisions to soil health outcomes. FFAR New Innovator Award. \$448,943.33.

Sprunger, C.D. Advancing plant production and diversifying STEM through dedicated training and mentorship. USDA NIFA National Needs Fellowship Program. \$79,500.

Jackson-Smith, D., Culman, S.W., Dooah, D., Kumarappan, S., **Sprunger, C.D.** Improving the Value of Scientific Research on Organic Systems: Incorporating Soil Balancing into Soil Health Management through Tiered Collaborative Research. USDA OREI. \$1,499,935.

Mercer, K., **C.D. Sprunger**, R. Dick, H. Perales, and V. Bernau. Dissecting the impacts of genetic and environmental variation on nitrogen fixation in maize. USDA AFRI. \$498,955.

Sprunger, C.D. Linking farmer management decisions to soil health outcomes. FFAR New Innovator Award. \$445,260.

Sprunger, C.D. and S.W. Culman. Uncovering the hidden half of cover crops: Linking belowground processes to soil health and agronomic performance. USDA AFRI. \$499,916

Culman, S.W. **C.D. Sprunger**, A. Hodson. Development of rapid nematode indicators to reflect soil food web functions. USDA AFRI. \$494,667.

Jackson-Smith, D., M. Chiavegato, S. Culman, S. Lyon, T. Parker, A. Shah, **C.D. Sprunger**, and H. Wang. 2019. Comparing Environmental Tradeoffs and Synergies of Alternative Modes of Integrating Livestock into Cash Grain Cropping Systems. USDA NIFA IDEAS. \$1,000,000.

Lindsey, A. and **C.D. Sprunger**. 2019. After the Flood: Impacts on Rhizosphere Biology, Nutrient Cycling, and Corn Growth and Yield. USDA AFRI. \$494,667.

Singh, P., N.C. Kawa, **C.D. Sprunger**. 2020. An integrated approach to assessing the impacts of extreme precipitation on soil health and farmer decision-making in Ohio. USDA North Central Sustainable Agriculture Research and Education Graduate Student Grant. \$9,930.

Chen, C., Lyon, S., Demyan, S., **Sprunger, C.D.** 2020. Wireless In-Situ Soil Sensing System Development. National Science Foundation. \$939,401.

Tomich, T.P., Scow, K., Hoy, C., Geisseler, D., Ullmann, K., Huber, P., Lipschitz, F., Culman, S.W., **Sprunger, C.D.**, and Jackson-Smith, D. 2018. Tipping the scales towards

a sustainable food system connecting soil health practices from microbiomes to working landscapes. USDA SAS. \$9,997,893.

Invited Seminars, Extension Workshops, and Media

Sprunger, C.D. An integrated approach to assessing soil health for enhanced ecological function. O'Neill School of Public and Environmental Affairs Environmental Science Seminar. Indiana University. April 2024. Invited Seminar Speaker.

Sprunger, C.D. and Martin, T. What can beneficial nematodes tell us about soil health? MSU Extension Field Crop Webinar Series. February 2024. Attendees, n=118. Invited Webinar.

Sprunger, C.D. Soil Health, Nutrient Cycling, and Soil Biology in Reduced Tillage Systems. Organic vegetable production webinar series. University of Wisconsin. 2024 Invited Speaker.

Sprunger, C.D. Building a soil food web database to inform soil health in agroecosystems. ASA-CSA-SSSA Annual Meetings. St. Louis, MO. October 2023. Invited Speaker.

Sprunger, C.D. Nematodes as bioindicators of climate resiliency in agroecosystems. Diversity in STEM conference. SACNAS. Portland, OR. October 2023. Invited speaker.

Sprunger, C.D. 2023. Rhizosphere dynamics drive soil health and ecosystem services in agroecosystems. Department of Plant Biology. Athens, Georgia. October 2023. Invited Seminar Speaker.

Sprunger, C.D. 2023. Designing resilient agroecosystems: What is the role of soil health? Danforth Plant Science Center. St. Louis, Missouri. September 2023. Invited Seminar Speaker.

Sprunger, C.D. 2023. Promoting soil health management for enhanced agronomic performance and ecological function. School for Environment and Sustainability. Ecosystem Science and Management Seminar Series. University of Michigan. April 2023. Invited Seminar Speaker.

Sprunger, C.D. 2023. Advancing soil health assessments for enhanced agronomic performance and ecological function. Department of Environmental Science Seminar Series. University of Toledo. April 2023. Invited Seminar Speaker.

Sprunger, C.D. 2023. Baseline assessment of Soil health in Ohio (and our vision for assessments in Michigan). Soil Health Nexus Digital Café. Virtual Seminar. February 2023. Invited Speaker.

Sprunger, C.D. 2023. Regenerative Agriculture for new roots and soil health. Seminar. New Roots for Restoration Biology Integration Institute Seminar Series. The Danforth Center. January 2023. Invited Seminar Speaker.

Sprunger, C.D. 2022. Linking soil food web structure and function to soil health in agroecosystems. Special Session: The Microbiome of Soil Health. ASA-CSA-SSSA International Annual Meetings. Baltimore. November 2022. Invited Oral Presentation.

Sprunger, C.D. 2022. Enhancing soil health: Opportunities for climate mitigation and adaptation in agroecosystems. North Central Climate Collaborative Webinar Series. Invited Speaker.

Sprunger, C.D. 2022. The integration of nematode communities into the soil health framework. Department of Biological Sciences Seminar Series. Western Michigan University. Invited Speaker.

Sprunger, C.D. 2022. Soil carbon sequestration as a climate solution: Is there a market? Carbon Market Working Group. LTER All Scientist Meeting. Pacific Grove, CA. Invited Speaker.

Sprunger, C.D. 2022. Advancing soil health assessments for enhanced agronomic performance and ecological function. Pacific Northwest Laboratory. Environmental, Molecular Sciences Laboratory (EMSL) Exchange. Invited Speaker.

Sprunger, C.D. 2022. Lessons from the Rhizosphere: Opportunities for Climate Mitigation and Adaptation in Agroecosystems. University of Missouri Interdisciplinary Plant Group Symposium. Invited Speaker.

Sprunger, C.D. 2022. Advancing soil health assessments for enhanced agronomic performance and ecological function. Department of Geography. University of Wisconsin. Invited Speaker for the Yi-Fu Lecture Series.

Sprunger, C.D. 2022. Advancing soil health assessments for enhanced agronomic performance and ecological function. Department of Soil, Water, and Climate. University of Minnesota. Invited Speaker.

Sprunger, C.D. 2022. Rhizosphere dynamics drive soil health and plant performance in agroecosystems. Soil and Water Sciences Department. University of Florida. Diversity, Equity, & Inclusion Committee Invited Seminar Speaker.

Sprunger, C.D. 2022. Soil Biology Scientific Round Table Discussion. Washington State University Soils Conference 2022. Invited Panelist.
<https://www.youtube.com/watch?v=snVGOXSZAno&list=PLBU9aYUI-eYLLBBu-BxbTNMIYJvXlunh&index=8>

Sprunger, C.D. 2021. Advancing soil health assessments for enhanced agronomic performance and ecological function. Kellogg Biological Station and The Department of Plant, Soil, and Microbial Sciences. Michigan State University. Invited Speaker.

Sprunger, C.D. 2021. Rhizosphere dynamics drive soil health and plant performance in agroecosystems. Department of Plant Pathology. The Ohio State University. Invited Speaker.

Sprunger, C.D. 2021. Carbon Markets. Ask the Expert Panelist. Farm Science Review. The Ohio State University. Invited Panelist.

Sprunger, C.D. 2021. Soil Carbon Pools and their connection to soil health. Soil Health Nexus Conference. Michigan State University. Invited Speaker.

Sprunger, C.D. 2021. Encourage development of root stocks that increase carbon capture and can support grain crop cover. Agricultural Genome to Phenome Initiative. USDA funded virtual conference. Invited Speaker.

Sprunger, C.D. 2021. How do rhizosphere dynamics drive soil health in agroecosystems? Kellogg Biological Station Seminar Series, Michigan State University. Invited Seminar Speaker.

Sprunger, C.D. 2021. How do rhizosphere dynamics drive soil health in agroecosystems? Department of Environmental Science, Policy, and Management, University of California, Berkeley. Spring Seminar Series. Invited Seminar Speaker.

Sprunger, C.D. 2021. Which management practices most influence soil health in organic corn production? The Ohio State University Organic Webinar Series. Virtual Oral Presentation.

Sprunger, C.D. and T. Martin. 2020. Drivers of rhizosphere dynamics and soil biological health in agroecosystems. ASA-CSSA-SSSA International Meetings. Invited oral talk (Virtual).

Sprunger, C.D. 2020. How do rhizosphere dynamics drive soil health in agroecosystems? Department of Plant Science Fall Seminar Series, Penn State University. Invited Seminar Speaker.

Sprunger, C.D. 2020. Can nematodes serve as effective soil health indicators? Washington State University Soil Health Seminar. Oral Presentation.

Sprunger, C.D. 2020. The role that roots play in building soil organic matter and soil health. Association for Ohio Pedologists. February 27, 2020.

Sprunger, C.D. 2020. The role that roots play in building soil organic matter and soil health. Conservation Tillage Conference. March 4, 2020.

Sprunger, C.D. 2019. How do soils provide important ecosystem services? Invited Speaker. Environmental Professionals Network. Columbus, Ohio. December 4, 2019.

Sprunger, C.D. 2019. Perenniality or Diversity: Which is most effective at providing ecosystem services within agro-ecosystems? Ames, IA. Invited Speaker. Department of Agronomy seminar series, Iowa State University.

Sprunger, C.D. 2019. Embracing Difficult Conversations: The necessary path to diversifying soil science. Amherst, MA. Bridge Scholar/Invited Speaker. Stockbridge School of Agriculture Seminar Series: Bridge2Impacts, University of Massachusetts.

Sprunger, C.D. 2019. Perenniality or Diversity: Which is most effective at providing ecosystem services within agro-ecosystems? Amherst, MA. Bridge Scholar/Invited Speaker. Stockbridge School of Agriculture Seminar Series: Bridge2Science, University of Massachusetts.

Sprunger, C.D. 2019. Perenniality or Diversity: Which is most effective at providing ecosystem services within agro-ecosystems? Columbus, OH. Invited Speaker. Department of Horticulture and Crop Seminar Series, The Ohio State University.

Sprunger, C.D. 2019. What management practices most influence soil health in corn production? Conservation Tillage and Technology Conference. Ada, OH. Invited Speaker.

Sprunger, C.D. 2019. Sustainable Agriculture: Can we increase crop productivity while reducing agriculture's environmental footprint? Department of Biology Seminar Series, College of Wooster. Wooster, OH. Invited Seminar Speaker.

Sprunger, C.D. and S. W. Culman. 2019. On-farm evaluation of crop diversity effects on soil health and ecosystem function in the Great Lakes Region. Special Session. Soil Science Society of America International Annual Meetings. San Diego, CA. Invited Oral Presentation.

Sprunger, C.D. 2018. Root production and soil carbon dynamics in agroecosystems. Microbial Based Solutions for Agriculture. The Ohio State University. Wooster, OH. Invited Oral Presentation.

Sprunger, C.D. 2018. Root production and soil carbon dynamics in agroecosystems: A biogeochemical and social science approach. School of the Environment and Natural Resources, The Ohio State University. Invited Oral Presentation.

Sprunger, C.D. 2017. Managing soil carbon: Implications for enhanced crop productivity, long-term soil health, and climate change mitigation. Department of Biology Seminar Series, East Carolina University. Invited Seminar Speaker.

Sprunger, C.D. 2017. Diversity and Inclusion in STEM. Department of Biology, East Carolina University. Greenville, North Carolina. Invited Oral Presentation.

Sprunger, C.D. 2017. Soildoc Maproom Climate Tool Application. USAID funded workshop. Morogoro, Tanzania. Extension Talk: Invited Oral.

Sprunger, C.D. 2016. The importance of Active Soil C. Prairie Public: Main Street Radio. Radio Show Interview. Friday, July 22, 2016.
<http://www.prairiepublic.org/radio/mainstreet>

O'Neill, B.E. and **C.D. Sprunger**. 2015. Results of soil health tests on Michigan farms. Farming for the Future Conference. Paw Paw, MI. Extension Talk: Oral.

Sprunger, C.D., S.S. Snapp, and S.W. Culman. 2013. Management impacts on belowground carbon dynamics: annual versus perennial cropping systems. Special Session on Managing Belowground Processes in Agroecosystems. Ecological Society of America Annual Meeting, Minneapolis, MN. Oral Presentation.

Sprunger, C.D. and B. Gottshall. 2012. Perennialization in Urban and Rural Landscapes to Enhance Ecosystem Services. LTER All Scientist Meeting. Estes Park, CO. Oral Presentation/Workshop Moderator.

Presentations

Durso, L.M, Cater, T., Obour, AK., **C.D. Sprunger** and others. ASA. CSSA. SSSA Diversity, Equity, and Inclusion Committee Showcase Poster. ASA-CSA-SSSA International Annual Meetings. November 2022. Poster Presentation.

+Wanderson, N. **C.D. Sprunger**, L.E. Lindsey, S. Khanal, O. Ortez, M. Mann*, and A.J. Lindsey. Assessing various N sources and water excess on corn growth and grain yield. ASA-CSA-SSSA International Annual Meetings. November 2022. Oral Presentation.

+Wanderson, N. **C.D. Sprunger**, L.E. Lindsey, S. Khanal, O. Ortez, M. Mann*, and A.J. Lindsey. Elucidating how N management practices and excess water conditions affect corn N uptake and grain yield. ASA-CSA-SSSA International Annual Meetings. November 2022. Poster Presentation.

Martin, T. and **C.D. Sprunger**. Thirty-years of long-term management shifts nematode community composition across a suite of cropping systems. ASA-CSA-SSSA International Annual Meetings. November 2022. Oral Presentation.

Martin, T. and **C.D. Sprunger**. Assessment of soil food webs across time: How do nematodes infer shifts in community structure over 30 years under varying agroecosystems? Ecological Society of America. August 2022. Oral Presentation.

Sprunger, C.D. and Martin, T. 2020. Exploring the relationship between key soil health indicators and nematode community composition in agroecosystems. American Geophysical Union Annual Meetings (virtual). Poster Presentation.

Hoekstra, N.C. **C.D. Sprunger**, N.T. Basta, M.M Gardiner, and S.W. Culman. 2019. The impact of Vegetation Management Strategies on Soil Health in Urban Vacant Lots. Soil Science Society of America International Annual Meeting. San Diego, CA.

Wade, J., S.W. Culman, T.T. Hurisso, and **C.D. Sprunger**. 2019. Benefits and Limitations of Soil Carbon, Nitrogen and Biological Measures of Soil Health. Soil Science Society of America International Annual Meeting. San Diego, CA.

Sprunger, C.D., S.W. Culman, C.A. Palm, B. Vanlauwe. (2017). Integrated soil fertility management has altering effects on soil health and crop productivity across sites in Kenya. Soil Science Society of America Meeting. Tampa, Florida. Oral Presentation.

Sprunger, C.D., and G.P. Robertson. (2015). Differences in active, slow, and resistant soil carbon fractions under annual and perennial biofuel crops. Long Term Ecological Science All Scientists Meeting. Estes Park, Colorado. Poster Presentation.

Sprunger, C.D., G.P. Robertson, R.D. Jackson, and L.G. Oates. 2015. Differences in fine root production and C allocation among perennial cropping systems in contrasting soils of the upper Midwest. Ecological Society of America Annual Meetings. Baltimore, Maryland. Oral Presentation.

Sprunger, C.D., and G.P. Robertson. 2014. Differences in active and slow soil carbon fractions under annual and perennial biofuel crops. Soil Science Society of America Meeting. Long Beach, CA. Poster Presentation.

Sprunger, C.D., S.S. Snapp, and S.W. Culman. 2013. Root production an indicator for belowground nitrogen use efficiency in perennial and annual grain cropping systems. Soil Science Society of America Meeting. Tampa, FL. Oral Presentation.

Sprunger, C.D., S.S. Snapp, and S.W. Culman. 2013. Implications for carbon sequestration: Management effects on annual and perennial root production. Michigan Organic Reporting Session, East Lansing, MI. Poster Presentation.

Sprunger, C.D., S.S. Snapp, and S.W. Culman. 2013. Implications for carbon sequestration: Management effects on annual and perennial root production. LTER Kellogg Biological Station All Scientist Meeting, East Lansing, MI. Poster Presentation.

Sprunger, C.D., S.S. Snapp, and S.W. Culman. 2012. Implications for carbon sequestration: Management effects on annual and perennial root production. Soil Science Society of America Meeting, Cincinnati, OH. Poster Presentation.

Sprunger, C.D., S.S. Snapp, and S.W. Culman. 2012. Annual vs. perennial roots: Implications for carbon sequestration in agriculture. Ford Foundation Fellowship Conference, Newport Beach, CA. Poster Presentation.

Sprunger, C.D., S.S. Snapp, and S.W. Culman. 2012. Conventional and Organic Management Effects on Annual and Perennial Root Biomass. Michigan Organic Reporting Session, East Lansing, MI. Poster Presentation.

Sprunger, C.D. and D. Zabowski. 2011. Organic farming and its effect on soil carbon content. Michigan Organic Reporting Session, East Lansing, MI. Poster Presentation.

Sprunger, C.D. and D. Zabowski. 2009. Organic farming and its effect on soil carbon content. Program on the Environment Symposium, University of Washington, Seattle. Oral Presentation.

Sprunger, C.D. and D. Zabowski. 2009. Organic farming and its effect on soil carbon content. Soil Science Society of America Meeting, Pittsburgh. Poster Presentation.

Fellowships, Honors, and Awards

Ecological Society of America Early Career Fellow	2024-2028
Agricultural and Environmental Letters Outstanding Paper of the Year Award	2022
National Science Foundation Post-Doctoral Fellowship in Biology, \$138,000	2016,2017
ASA, CSSA, SSSA Graduate Student Leadership Award	2014
Kellogg Biological Station Graduate Research Fellowship, \$1000	2014
ASA, CSSA, SSSA Future Leaders in Science Award, Washington D.C.	2014
National Ford Foundation Fellowship, \$66,000	2012-2014
Michigan State University Enrichment Fellowship, \$48,000	2010, 2015
Soil Science Society of America Meeting, Cincinnati, OH, Student Poster Award	2012
Michigan Organic Reporting Session, Graduate Student Poster Award	2013
National Science Foundation Graduate Research Fellowship, Honorable mention	2012
Kellogg Biological Station, Summer Student Fellowship, \$1000	2011
Michigan Organic Reporting Session, Graduate Student Poster Award	2011
Undergraduate Travel Award, Forest Resources, University of Washington, \$400	2009

Teaching, Advising, and Mentoring

<u>Teaching</u>	
Instructor , Michigan State University, <i>Sci. Comm; Professional Devel.</i>	2024- Present
Instructor , Michigan State University, <i>Soil Health Concepts in Agroecology</i>	2023-Present
Instructor , The Ohio State University, <i>Root and Rhizosphere Ecology</i>	2019-2022

Instructor, The Ohio State University, *Advanced Principles in Enviro Sci* 2021-2022

Co-Instructor, The Ohio State University, ENR 8890.04 2020-2022

Post-doctoral Researchers

Current: Katherine Naasko (2023-Present); Alexandria Smychovich (2023-Present)

Graduate Student Chair

Current: Tvisha Martin (PhD, CSS); Rachel Drobnack (MS, CSS)

Completed: Tvisha Martin (MS, ENR), Prabhjot Singh (MS, ESGP)

Graduate Student Committee Member

Current MS students: Sara Sadeghi (MSU, PSM); Sarah Munezero (MSU, PSM); Jasmine Bontrager (MSU, PSM); Brandon Scott (MSU, PSM)

Completed MS students: Ashly Dyck (SENR), Christine Charles (SENR), Francis Clark (HCS), Ana Vazquez (Plant Pathology), Jenna Moore (HCS), Chee Gang Ngui (HCS)

Current PhD students: Prabhjot Singh (OSU, SENR), Wanderson Novais (OSU, HCS), Marissa Zaricor (MSU, Plant Biology), Ojo Paul (MSU, Community Sustainability and PSM), Benjamin Kwadwo Agyei (MSU, PSM)

Completed PhD students: Andrea Leiva Soto (OSU, HCS) and Sean Fenstemaker (OSU, HCS)

Post-Bachelor Technicians

- Meredith Mann (2019 – Present)
- Hanna Korn (2022- Present)
- Emily Parker (2022 – Present)
- Louceline Fleuridor (2019)
- Nicole Hoekstra (2018-2019)

Undergraduate Research Assistants and Undergraduate Research Distinction

- Jacob Murray (Spring 2021-Fall 2023)
- Allison Bunce (Summer 2022)
- Ainsley Lightcap (Spring 2021-Summer 2022)
- Abby Rees (NSF REU 2022)
- Dani Alabyadh (Fall 2020-2021)
- Christian Mamana (NSF REU 2021)
- Ben Bridge (KBS URA 2023)
- Elena Zakolski (NSF REU 2023)
- Aiden Martin (Spring 2024-Present)

Service

Michigan State University

- Undergraduate Research Program Evaluators Committee
- 2024-2026

Michigan State University

- PSM/KBS Agroecology Search Committee
- October 2023-Present

Michigan State University

- Plant Resilience Institute Faculty Search Committee
- Multiple position search
- September 2023- Present

USDA NIFA

- Peer Review Panel Member
- Agricultural Microbiomes in Plant Systems and Natural Resources
- December 2022 – January 2023

Pedobiologia Editorial Board

- 2022- Present

Michigan State University

- Agronomy Committee
- November 2022- Present

Michigan State University

- Regenerative Agriculture Extension Educator Search Committee Member
- October 2022- February 2023.

Michigan State University

- Long-Term Agroecosystems Research (LTAR) Steering Committee
- August 2022-Present

Michigan State University

- KBS Cultural & Inclusion Committee
- August 2022- December 2023

USDA NCR-SARE

- Peer Review Panelist
- Graduate Student Research Grant Program
- 2021-2022

Soil Science Society of America Outstanding Dissertation Committee

- January 2020-Present

Agronomy, Crops, and Soils Diversity Society Committee

- January 2020-Present

Soil Science Society of America Science Policy Committee

- January 2020- December 31, 2022

The Ohio State University

- SENR Fellowship Committee
- Spring 2021-2022

The Ohio State University/OARDC

- ORIP Committee
- January 2020-2022

The Ohio State University

- SENR Academic Affairs Committee
- Fall 2019-2022

The Ohio State University

- InFACT Strategy, Research and Grant Opportunities
- Fall 2019

The Ohio State University

- Alpha Zeta Partners
- Spring 2019

The Ohio State University

- MENR Learning Objectives Ad Hoc Committee
- Spring 2019

The Ohio State University

- SENR Hydrology Position Search Committee
- Fall 2018-Spring 2019

The Ohio State University

- SENR Soil Science Curriculum Re-vamp
- Weekly meetings, Fall 2018; Spring 2019; Fall 2019

The Ohio State University

- InFact Discovery Theme Strategic Planning Retreat, Initiative for Food and AgriCultural Transformations, September 6, 2018

Peer Reviewer: PNAS, Biogeochemistry, Agriculture, Ecosystems, and the Environment, Plant and Soil, Soil Science Society of America, Geoderma, Agronomy Journal, Applied Ecology, Applied Soil Ecology, Nutrient Cycling in Agroecosystems, Global Change Biology, Journal of Animal Ecology, Ecology and Evolution

Mentor, The Fairy God-Sister mentoring program
New York City 2017-2018

Tour Guide, Long Term Ecological Research Site
Kellogg Biological Station, Michigan State University 2014-2015

Communicating Science Volunteer, Science Festival
Michigan State University April 2014

Graduate Student Representative, Seminar Committee
Kellogg Biological Station, Michigan State University 2014-2015

Graduate Student Representative, Academic Programs Committee,
Kellogg Biological Station, Michigan State University 2013-2014

Communicating Science Volunteer, Share the harvest, Kellogg
Biological Station, Michigan State University Oct. 2013

Graduate Student Representative, Graduate Program Committee,
Department of Plant, Soil, and Microbial Sciences, Michigan State University 2011-2013

Secretary, Crop and Soil Science Graduate Student Organization.
Department of Plant, Soil, and Microbial Sciences, Michigan State University 2010-2013

Co-Chair, Professional Development Committee,
Graduate Women in Science Association, Michigan State University Chapter 2011-2012

Professional Development Training

DEI Foundations: Building Leadership Engagement Strategy – Association for
Women in Science 2024

ADVANCEGeo Partnership Training, Kellogg Biological Station 2023

Teaching Assistant Seminar and Orientation, Michigan State University 2013

Science policy, Communication, and Advocacy training, ASA, CSSA, SSSA 2014

Mentoring workshop, W.K. Kellogg Biological Station 2013

Professional Memberships

Ecological Society of America, Soil Science Society of America, Crop and Soil Science Society of America, and Agronomy Society of America, Association for Women Soil Scientists, Graduate Women in Science, Xi Sigma Pi Honor Society.

Outreach, Public Engagement, DEIJ Efforts

Generated soil health test reports for farmers in the Midwest and Northeast.

Sprunger, C.D. Advancing soil health to inform soil carbon dynamics and biodiversity. Symposium: Research, Extension, and Programming Highlights of NCA&T and MSU. April 26, 2023.

Sprunger, C.D. Round Table Discussion: Preparing for oral defense workshop. Women of Color Initiatives. Michigan State University. February 2023. Invited Panelist.

Sprunger, C.D. 2023. A holistic approach to assessing soil health. Open Access Government. January 2023. <https://doi.org/10.56367/OAG-037-1040>.

Sprunger, C.D. 2022. In the Weeds: All there is to know about organic matter! Michigan Field Crops Team. Podcast.

Sprunger, C.D. 2022. Deteriorating soil health: 'A teaspoon of soil contains more life than there are humans on earth'. Open Access Government. October 2022. <https://doi.org/10.56367/OAG-036-10403>

Sprunger, C.D. 2022. The simple act of welcoming. Planting seeds and storytelling (DEIJ) Working Group. LTER All Scientists Meeting. Pacific Grove, CA. September, 2022.

Sprunger, C.D. 2022. Biodiversity! Smithsonian Science Education Center. [Science for Global Goals](#).

Scientia Feature: Tackling Soil Health from Every Angle. March 2022
<https://doi.org/10.33548/SCIENTIA803>

Generated soil health test results for 22 farmers across Ohio. Fall 2020.

Judge for Agronomy, Crops, and Soils Student Diversity Poster Competition. ASA-CSA-SSSA. Virtual Annual Meetings. November 2020.

Leaders of Color Career Panel: Young Professionals in the Environmental Space. River Network. October 7, 2020.

European Geosciences Union. Black in Soil Science Feature. Blog Post. 2020.
<https://blogs.egu.eu/divisions/sss/2020/07/06/black-in-soil-science/>

Soil health in the No-till trial presentation to legislative staffers. CFAES. August 23, 2019.

Designed hands on soil science activities for 5th and 6th grade students as part of the Expanding Your Horizons Girl's Science Day. College of Wooster. April 6th, 2019.

Lin, E., **C.D. Sprunger**, N. T. Basta. Report on Heavy Metal Contamination from UXO and Landmine Areas in Cambodia. Cambodian government. April 2019.

Sprunger, C.D. 2019. Feature Interview. Women in Ag Science Organization. April 2, 2019. <https://www.womeninagscience.org/post/christine-sprunger-soil-science-assistant-professor>.

Soil health testing for organic corn growers across Michigan, Indiana, Ohio, and Pennsylvania. Fall 2018 and Spring 2019.

Generated soil health test results for 200+ farmers across the Great Lakes Region. Fall and Fall 2018 and Spring 2019.